THE WELDING ENGINEER

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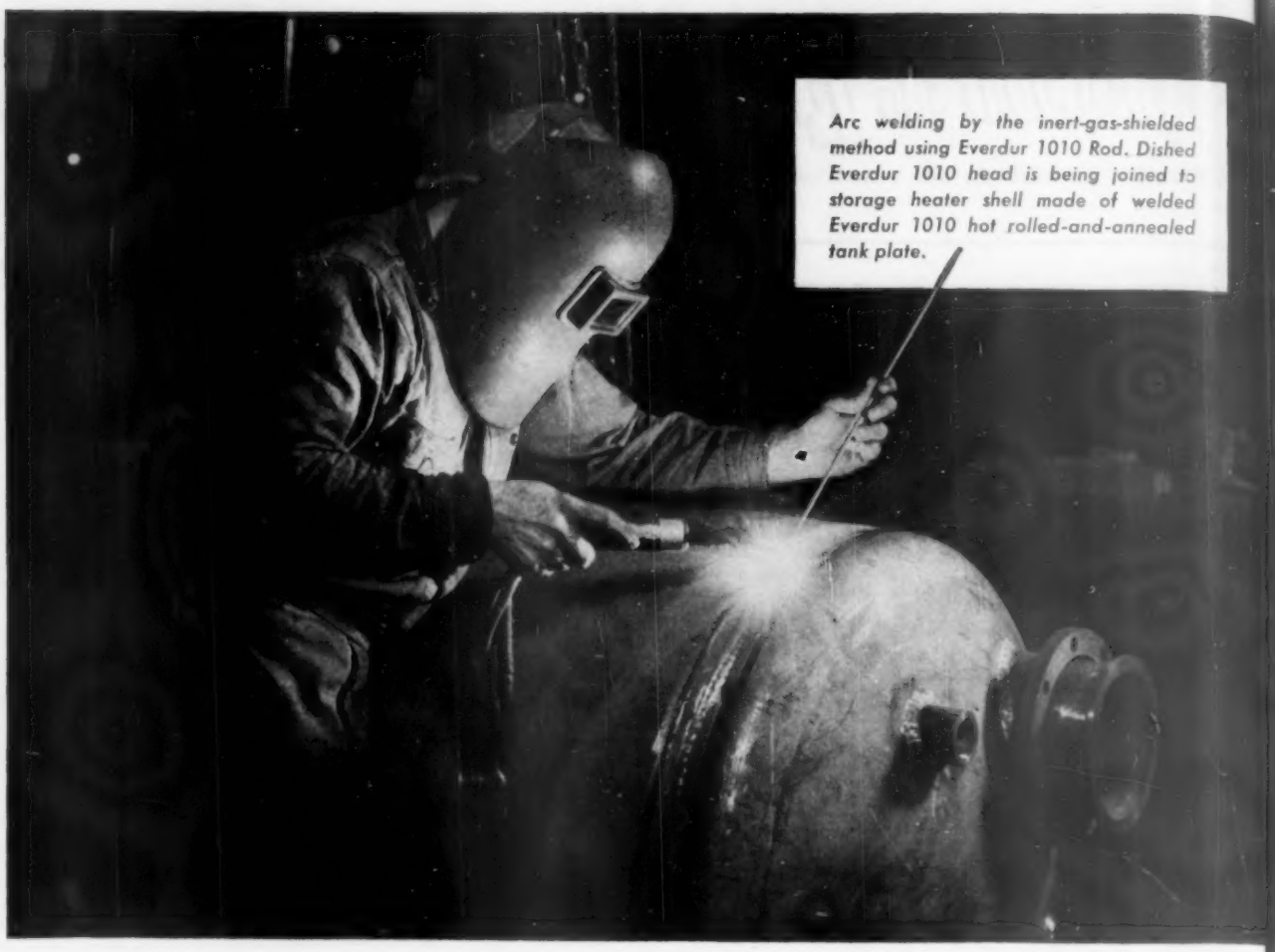

Arc welding by the inert-gas-shielded method using Everdur 1010 Rod. Dished Everdur 1010 head is being joined to storage heater shell made of welded Everdur 1010 hot rolled-and-annealed tank plate.

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THE WELDING ENGINEER

ESTABLISHED 1916 NOVEMBER 1948

X in the Square

By the time you read this, it will be just about time for you to go to the polls. Every two years we Americans have the privilege of selecting those who are to represent us in our Federal government. Every four years we are allowed to elect a president. We can enjoy this great privilege only because we are a free people. And it works the other way around, too—we can remain a free people only as long as we exercise our privilege of voting intelligently.

All over the world are myriads of people who would give their eyeteeth for the opportunity of choice in voting. Knowing from sad experience what it means not to have an effective vote, the inhabitants of these unhappy nations would not for anything pass the precious right by if it were theirs.

And what about us? If past experience be any criterion, some fifteen to twenty million qualified voters will stay away from the polls on Tuesday, November 2. They are too busy to vote, they say. Yes, it does take time—maybe five minutes or so.

Voting may force you to walk a block, perhaps even two blocks, out of your way. When you get there, you will probably have to stand in line for a little while before you get your ballot. Yes, it's something of a nuisance. But if the right to vote was considered worth dying for by our ancestors at Yorktown—and by those who later fought in Alsace-Lorraine and at Corregidor—it ought to be worth walking a short distance and awaiting a turn in line.

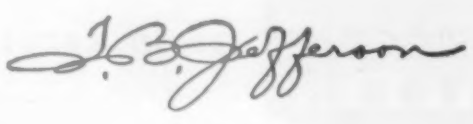
You have the dual right to vote as you see fit and to vote secretly. If you want a change, you may vote for it without any fear of reprisals. No one will ever know how you voted, so no one can punish you for it. If you want to endorse the men who are now in power, that too, is your privilege. Your vote may even be cast for a candidate whose program is to undermine our present form of government. But if you want to continue your present free way of life, be sure you know what you are doing when you mark that X in the square.

The candidate you choose in the presidential election may not be ideal in every way because he represents a series of compromises before his name appears on the ballot. Faults or not, he is certainly better than the candidate you don't want. Exercise your right to vote. It is the most precious of our many freedoms because it is the foundation of them all. The important thing for you to do is to vote; how is your own business.

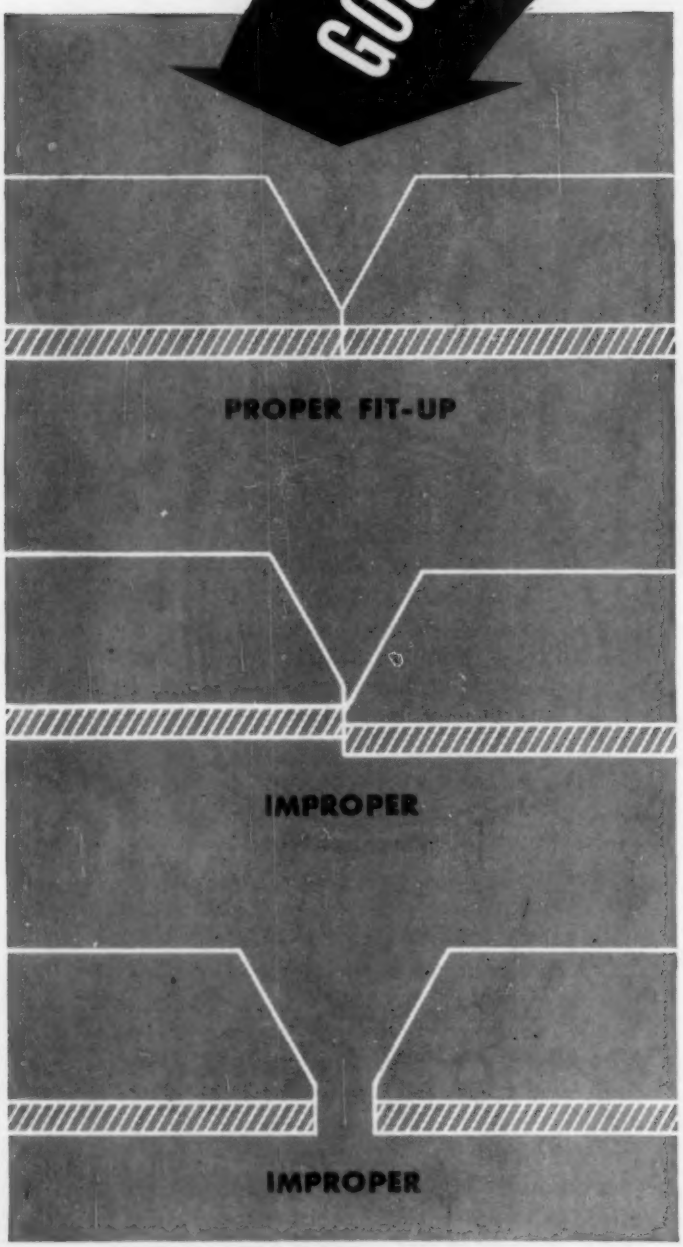
Remember, though, that in some countries that make a great palaver about "free elections" there is only one candidate for each office. You vote for him or else. You're not even allowed to stay away because elections are compulsory. You don't grumble, either, not if you want to be around long.

Not many of us want that sort of thing here. But there are some enemy agents working with traitors and sincere but misguided idealists to sell us a single-party system of government. We call them crackpots and the "lunatic fringe" and are inclined to pooh-pooh their efforts. Yet their plans are laid far ahead . . . four, eight years from now . . . when there is another election and enough people stay away from the polls to give them their chance.

Ignorance and public apathy are their best allies. They can't win as long as enough of us think enough of our precious privilege to vote to maintain it.



GOOD FIT-UP IS Necessary



In welding clad steels, accurate alignment and fit-up of edges to be welded is an important step following preparation of plate edges. Care in this operation simplifies the welding work. It is then easier to make a joint having high structural strength and preserving the integrity of the corrosion-resistant clad surface.

After establishing the alignment of the clad edges, tack-weld on the steel side to hold it there. Use any good grade of carbon steel electrodes. Then lay down the root bead on the steel side, taking care not to penetrate the cladding.

Complete the weld on the steel side and then chip it back from the clad side until sound weld metal is uncovered. Finally, fill this in with rod matching the cladding. You will have an unbroken corrosion-resistant surface, providing the protection for which the Lukens Clad Steel was selected.

Clad steels are readily welded if the joint is properly designed and the correct procedure followed. Lukens new 100-page booklet, "Fabrication of Lukens Clad Steels", contains information that should be helpful to you. For a copy of this Bulletin 399, write Lukens Steel Company, 416 Lukens Building, Coatesville, Pennsylvania.

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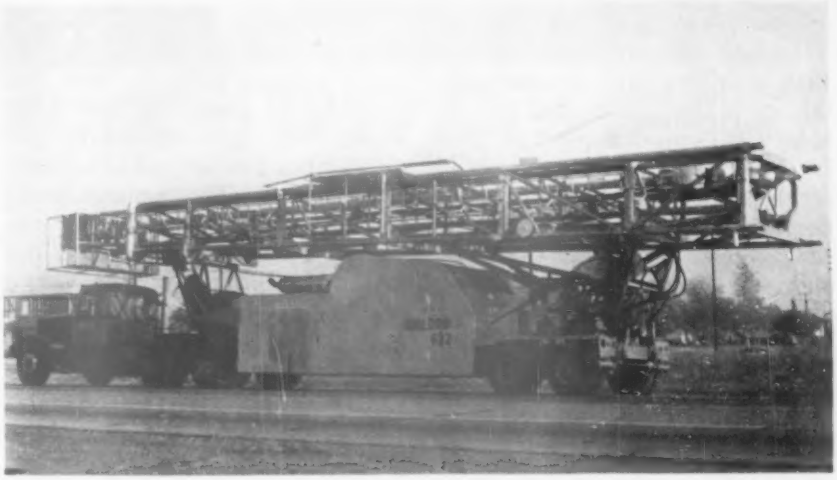
A Portable Rig for Oil Wells

Combination of a light tubular framework and welding makes possible unique traveling oil derrick that can be moved by trailer and erected in only four minutes

BY HENRY W. YOUNG

In times not so far away, wooden derricks will disappear from the oil fields. If the wells themselves do not dry up, at least the derricks will finally succumb to the incursions of time, and their functions will be assumed by a new type of equipment. Within the last decade, an all-welded portable rig has come to be almost universally used at all new sites and is rapidly displacing present derricks at old sites.



1—ON THE ROAD, the Waldrip derrick is a self-contained mobile unit that will conform to state highway specifications, at least in California

What a Derrick Does

To understand all this, let's discuss the general subject of oil-well drilling. Up to a few years ago, it was necessary to erect a derrick to drill a well. The derrick was often of wood but sometimes of steel, was upwards of 80 or 90 ft high and was built at a cost of from one to three thousand dollars. Its purpose was to handle the pipe in long sections as the drilling progressed. The power plant and all the other necessary equipment were installed near the base of the derrick.

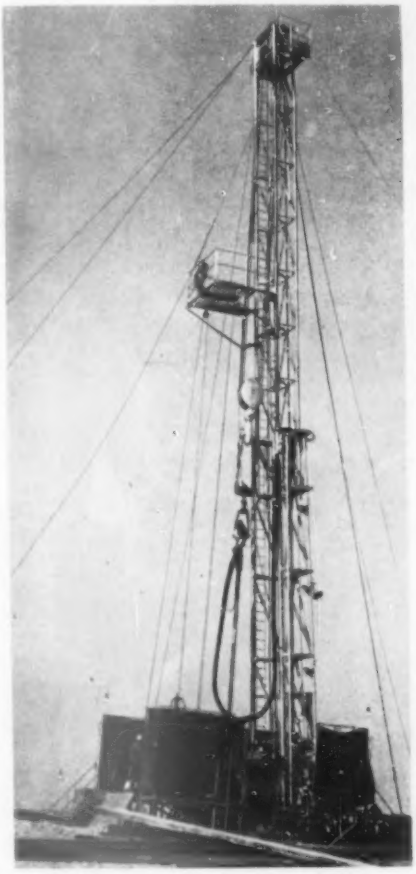
After the well was drilled, the derrick is used only for occasional maintenance. Now and then it is necessary to pull up the pump tubing section by section until the pump at the lower end can be brought to the top to be repaired. After repair, the reciprocating-type pump is lowered, pipe section by pipe section and including the sectionalized pump rod inside. In the case of the deepest wells, the pump hangs suspended on its pipe line to a depth of over 9,000 ft or nearly two miles.

Fortunately, the pump does not have to come up very often, and the derrick investment stands there for years, eating its head off in interest charges and presenting no little fire hazard. In the richest fields inflammable wooden derricks stand so thickly that they present the appearance of trees in a forest.

Oil companies having many wells and many derricks tried to solve this problem of economics. First, they reasoned, as long as the derrick was but little used why couldn't it be moved, along with the power plant and drilling equipment, to another new well and from there to another or to servicing some well already drilled? But the wooden derrick was strictly not portable. To tear it down and move it even once would cost more than it was worth.

Trailer-Moved Drilling Rig

Portable steel derricks, riveted and bolted together, were tried next. These were a little help, but they could not be moved without disassembling them and putting them together again, so the saving was not great. What was needed, the companies concluded, was a fully portable derrick which could be moved over the highways on a single trailer and could be set up on the site in a very short time either to drill a new well or service an old one. With advancements made in the art of welding, it became possi-



2—RAISED, an inner telescoping section is run up to gain height

ble to design and fabricate such a portable derrick.

One of the leading engineering companies in this and other lines of oil-well equipment is the Waldrip Engineering Co., Hollydale, Calif. This company now designs and builds fully portable oil-well drilling and servicing rigs, either as standard models or to the oil companies' specifications.

Typical of these is the Waldrip-Western model 622, Figs. 1 and 2. Both a drilling and servicing unit, this rig is designed to drill full-size holes (5 9/16-in. drill pipe) to 5,000 ft and "slim" holes (3½-in. drill pipe) to 7,500 ft. It will service the deepest producing wells. Other smaller models and one larger are built, but this rig is typical and well illustrates the principles of operation and the average problems of construction. The use of steel tubing for the framework, resulting in a structure of great strength and lightness, has been made possible by advancements in welding.

Fig. 1 shows the derrick ready for the road. Practically all the equipment, including a 350-hp Diesel engine and the draw works is contained in the aluminum body of the trailer. Only the swivel, kelly and rotary table and pumps are transported separately. This unit will conform to the state highway regulations, at least in California, and off the main roads will negotiate ordinary roads or almost any terrain.

Hoisting the Derrick

On arrival at the drilling or servicing site, the derrick is raised by engine power until its four legs stand on the ground in back of the trailer. The inner telescoping section is then run up and locked into place (Fig 2). The nominal height is 96 ft extended and 58 ft telescoped. Total raising time does not exceed four minutes. The crow's nest is on the top, and a low working platform is erected around the foot. The trailer does not show in this picture, being beyond the platform and windbreaks.

An inspection trip through the Waldrip shops will show that welding has been employed as the fabrication process from the very beginning. In building the derrick frame, the inner of the two telescoping sections is constructed first and then used as a jig over which to build the larger, lower section. This saves time and insures an absolute fit. All work is laid out on transverse rails in the concrete floor, the surfaces of which are lined up with a surveyor's level.

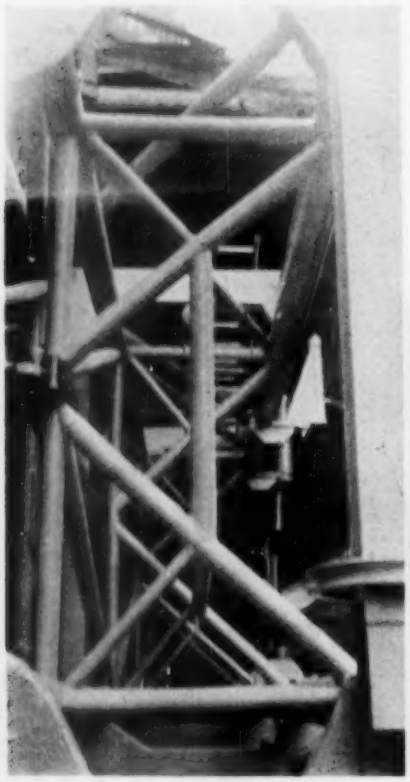
Fig. 3, a view looking into the large section from one end, indicates the great number of welds that must be made. The corner pipes or legs seen here are of cold-drawn chrome-moly seamless tubing, X4130 (SAE), 5 in. in diameter with ¼-in. walls. Diagonals and girts are seamless tubing of 1015 steel of various types and sizes—4½ in., 3¾ in., 2 in. and 1½ in. Where 1015 joins the X4130 tubing, a high-strength electrode (AWS E-7010) is used, and the joint is preheated. Pipe joints for the tower are all ground-fitted and beveled with a cope for the pipe contour.

Welded Cross Stations

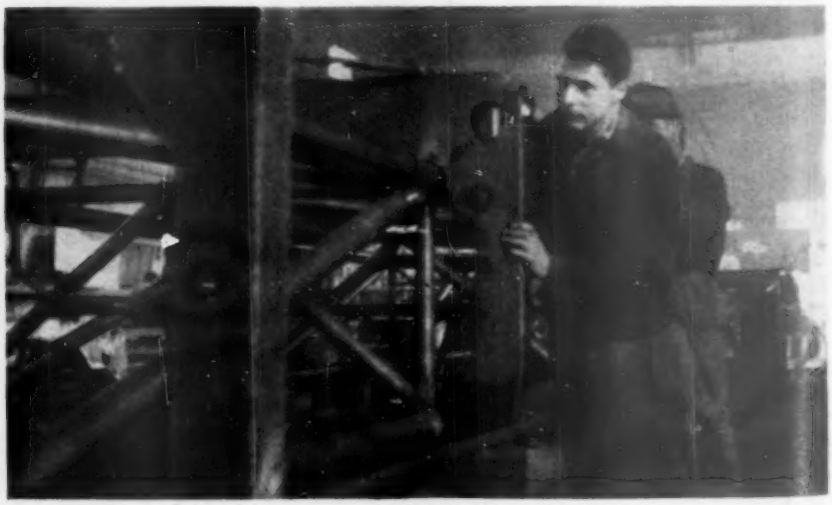
The fabricated cross members or stations, by means of which it is possible to telescope the two sections of the tower, are of low-alloy steel. Fig. 4 shows two of the welded cross stations through which the tower telescopes. All leg joints have a splice pipe inside for safety and to back up the welds. All fits are metal to metal. Oxyacetylene welding is required for the light-metal crow's nest at the top of the tower.

Two of the legs are used for derrick services—one carrying all electrical wires and one for compressed air. Suitable couplings must of course be provided at the junction point of the two sections.

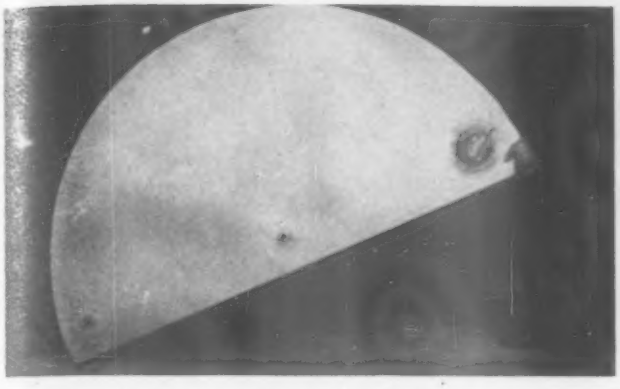
The housing of the main body of the trailer contains the Diesel engine, torque converter and other drive and control and braking equipment for the main drum and sand reel. Body and interior framework are of high-tension aluminum



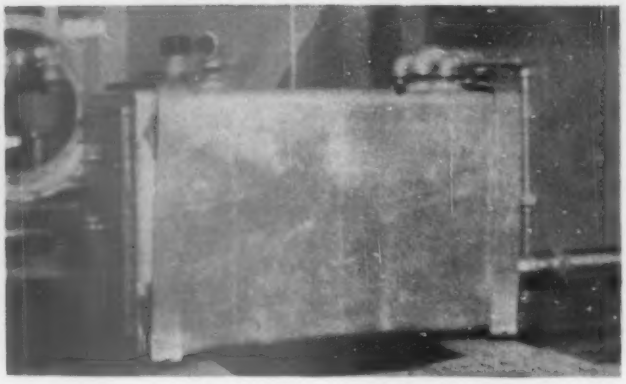
3—STEEL TUBING provides the key to the derrick's construction



4—TOWER TELESCOPES through welded cross stations fabricated of low-alloy steel. Leg joints have a splice pipe inside to back up welds



5—FUEL-OIL TANK for 350-hp Diesel that raises and lowers rig. Tank is of 10-gauge aluminum sheeting



6—STORAGE TANK for the oil used in the hydraulic systems is also made of welded aluminum sheet stock

sheets riveted with high-shear aircraft rivets. Heretofore, it has not been found practicable to attempt to weld this sheathing, although experiments are being made in this direction.

Aluminum is used wherever possible to save every pound that can be saved in the weight of the carrier as a whole. An example is the fuel-oil tank shown in Fig. 5. This is a completely welded job, using an oxyacetylene torch and type S aluminum welding rods to fabricate the 10-gauge aluminum sheets. Tank has a capacity of 109 gallons, and one man can easily lift one end of it.

Another welded aluminum job inside the trailer body is the tank shown in Fig. 6. This is the oil storage tank for the hydraulic systems employed in the unit. The torque converter, located behind the engine and coupling the latter with the hoist, has its own separate system.

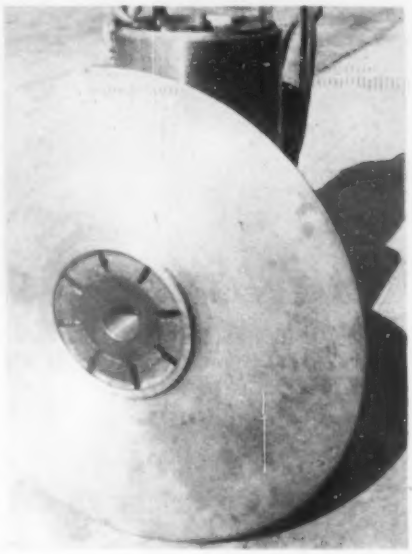
The main drum hoist, sand-reel hoist, gear boxes, crank cases and many other minor operations all present their individual welding problems. The hoist drums with their attendant equipment are assembled almost wholly by welding. The general design of the drums includes such features as built-in and completely enclosed friction clutches, water-cooled brakes, flame-hardened alloy-steel removable brake rims, grooved drum barrels and self-aligning anti-friction bearing mountings with single-point lubrication completely outside the drum. Instead of a drum shaft, the drum rotates on a pair of trunnions at the ends, a type of construction that saves considerable weight.

The sand-reel drum (Fig. 7) calls for special welding technique to secure a high degree of precision, for the drum ends must be parallel to within $\frac{1}{16}$ in. when assembled. The drum shown is 13 in. in diameter by 37½ in. long. It is rolled out of steel sheet in two halves, edges of which are welded together to make a cylinder.

To give the drum more stiffness and strength and also to provide means for welding on the end plates or flanges, four longitudinal ribs are welded into each half. These ribs are $\frac{3}{8}$ in. thick by 2 in. wide; their ends may be seen projecting beyond the end of the drum in Fig. 7. The ribs are welded to the drum shell with a fillet bead on each side before the trough-like half drums are put together. The latter operation is performed by scarfing the edges and butt welding. The ends of the drum are then scarfed for welding to the end flange.

The flange shown in the foreground has a locating ring on the face, over which the end of the barrel slips. There are also eight slots clear through to receive the ends of the ribs when the drum is in place. When the drum is slipped over the locating ring, the ends of the ribs in the slots are plug welded. Finally, the juncture of the scarfed end of the drum and the surface of the end plate is effected, and the close tolerance of $\frac{1}{16}$ in. of parallel between the two plates is secured by peening.

While it is not shown in the picture, a clutch drum, fabricated of rolled and welded steel plate, will be welded onto the face of the flange opposite the face shown in Fig. 7. Eventually, also, the brake drum will

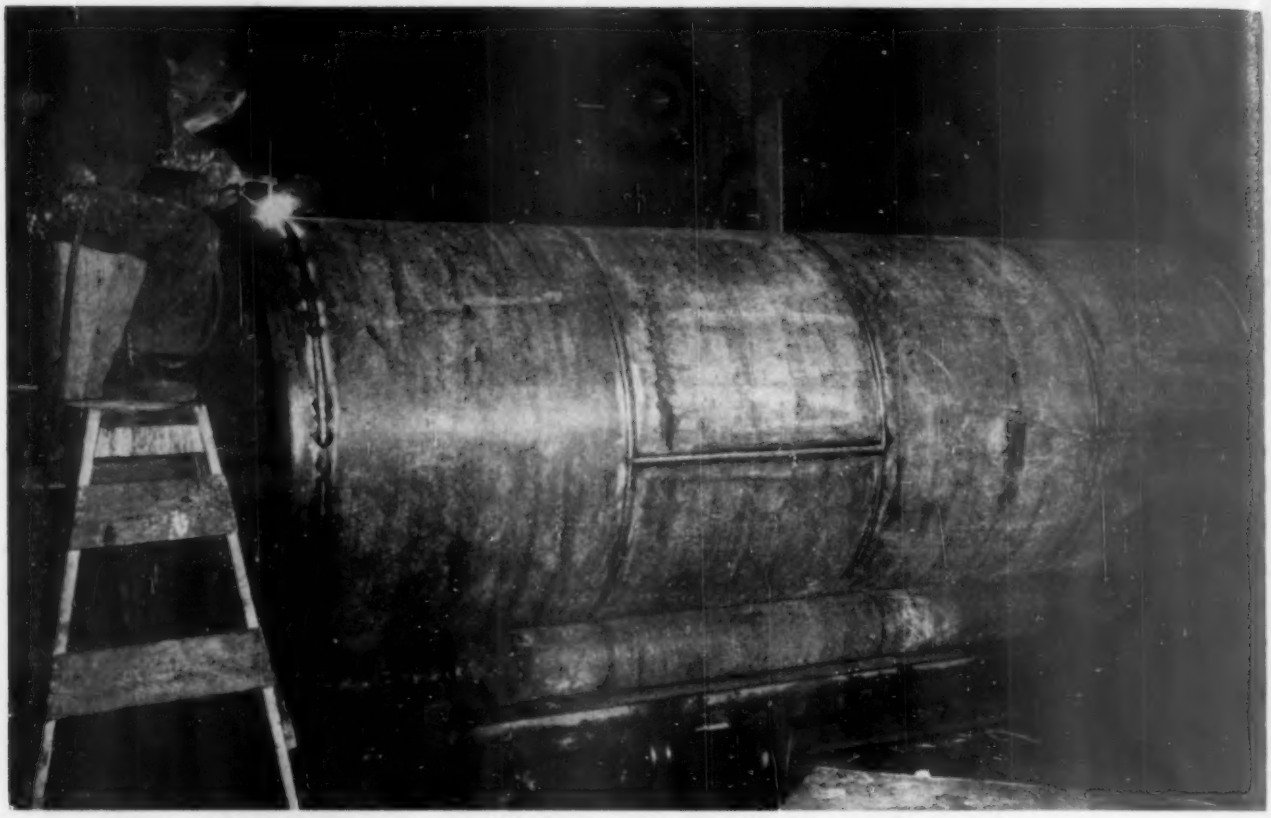


7—SAND-REEL drum (standing) is welded to the 28¼-in. flange

be attached to the outer circumference of the drum flange by bolting.

Welding work on the main drum is somewhat more intricate because the unit is larger and has more equipment on it. For instance, it has two friction clutches, one built into each end of the drum and each driven by a different ratio, so that a high-low speed shift is obtained without gear change.

The cost of these rigs runs high when the power plant and all the other equipment is included along with the derrick and trailer. But the true economy lies in the fact that this invesment is "on wheels" and is always employed in productive work, either drilling new wells or servicing old ones. Every time you leave a drilling job you don't leave $5,000 behind in the shape of a tower and other equipment required only on rare occasions.



1—POWERED TRUNNIONS are installed the length and width of the welding bay at Richmond Engineering Co., Inc., Richmond, Va. In above picture a large silicon-copper tank is being rotated for welding by the carbon arc

Sixty certified weldors on ASME code work fabricate a variety of pressure vessels

RECO makes

THE seven-acre plant of Richmond Engineering Co., Inc., Richmond, Va., has a splendidly equipped welded plate department in a 600 by 121 ft building. The 68-ft welding bay is serviced by 30-ton and 5-ton cranes on 65-ft craneways, and most of its production is in line flow.

WIDE VARIETY OF WORK

The shop produces tanks in variety, ASME code vessels, heat-exchanger equipment, metal septic units, oil-storage tanks and heat reclaimers. Much special fabrication is done for the chemical, rayon and wood pulp industries. The shop works in aluminum, copper, stainless steel, mild steel and such copper alloys as Everdur and Herculoy. Tank diameters run to 12 ft, capacities to 30,000 gal and over, plate thicknesses up to 1 in. Welding department is large and complete.

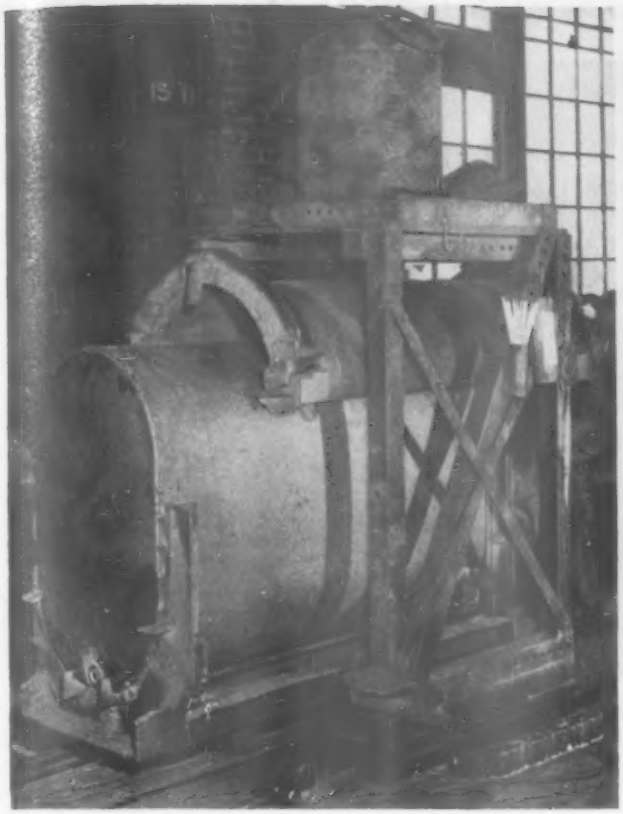
RECO employs 394 workers, better than 60 of whom are certified weldors on ASME code work. Turnover is 8% a month, a higher figure than it should be considering that the plant's grievance rate is nil and its labor relations unusually good.

President Thomas J. Starke believes in personalizing his personnel operations, is progressive and a humanitarian. He handles labor relations as he does his customer relations, insists on achieving satisfaction rather than technical correctness and has exceptionally amicable relationship with union representatives. Both Starke and the union's head attend the same church, and their pastor is called upon as occasional arbiter. RECO is an open shop operating on a union contract. Supervisional ratio is one to 20, absenteeism is 5% for all causes, accident rate is 58.95 per 1,000,000 man-hours, calling for installation of a safety program.

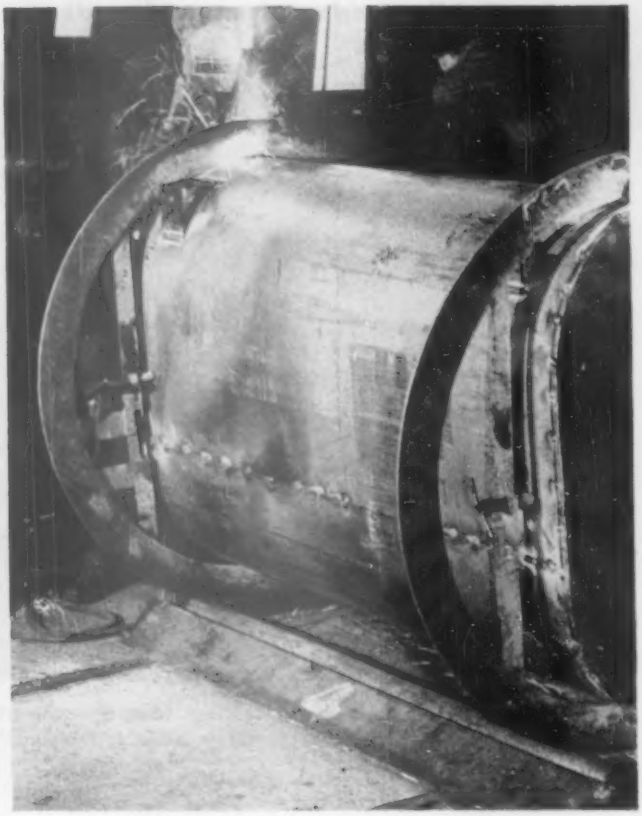
This was my 993rd plant visit since 1942. I was ably assisted by James C. Farley, production manager, and Paul Hickman, chief engineer.

FLANGING TANK HEADS

Heads for much of RECO tank production are hot formed on an 800-ton press, which dishes and flanges in one hit. This press is serviced by an oil-fired heating furnace and has a ram speed of 300 ipm. All larger diameter heads are cold formed on dishing presses and flanged on flangers capable of effecting a 2½ to 3 in. straight flange on work up to 12-ft diameter. I noticed the cold flanging of a 10-



2—OBROUND basement tanks are assembled and tacked on this fixture. An air cylinder clamps the work



3—ROLLING of obround tanks for welding is made possible by hoops, installed by clamp screw on ends

TANKS

BY GERALD ELDRIDGE STEDMAN

ft stainless-steel head of $\frac{3}{8}$ in. thickness, using the knuckle bending principle. A biter of the flanger moved around the periphery to form the knuckle and $2\frac{3}{4}$ in. flange in two machine hours, using two operators.

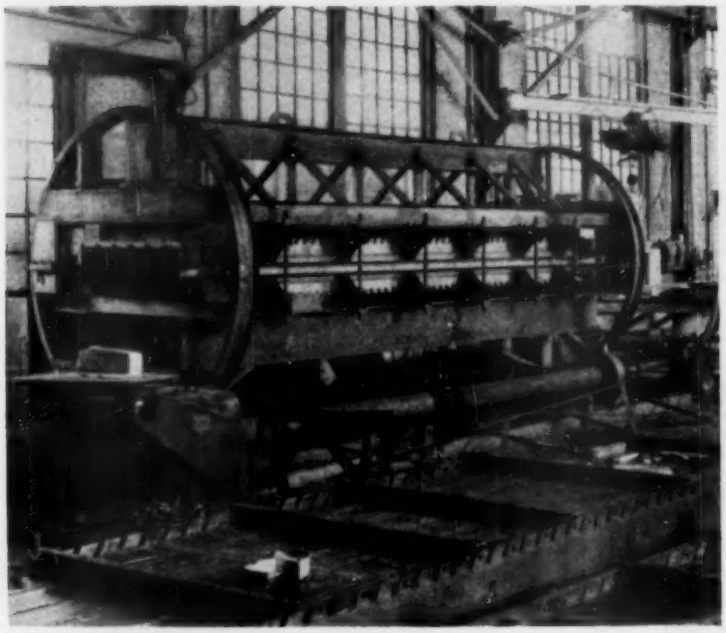
Fabrication Department

The fabrication department, which backs up the welded plate division, is fully equipped with machine tools, including 14-ft press brakes equipped with a variety of punch and brake rails, a shear handling $\frac{3}{4}$-in. by 10-ft plate, other types of shears, angle rolls, pinch-type plate roll handling $\frac{3}{4}$-in. by 12-ft plate, horizontal multiple drills, etc. The RECO machine shop has modern engine lathes, vertical turret lathes, milling machines and radial drills.

During the war, RECO made outstanding fabrication history in its welding procedure for Mark IV tank hulls by developing a specially designed hoop-type rotating positioning and welding jig with power-driven floor trunnions (Fig. 4). The top segment of this jig is removable for loading work, providing locating devices and clamping facilities to maintain dimensional tolerances within $\pm\frac{1}{8}$ in. over a 20-ft length. The trunnion rolls run in an 8-in. channel track by 3-hp motor, button controlled. This jig attracted the attention of other large companies, for whom RECO provided similar facilities.

Presently, the tank-hull jig is being used in the welded construction of huge steel cases of intricate fabrication for the rayon industry. These steel cases are made up of welded subassemblies, which include a bottom header assembly, case bottom and cover sheet channels. The case, made up of welded Z-sections of No. 10 gauge sheet steel, is 25 ft tall and has a total weight of 3,000 lb. It involves 350 ft of welding, all of which is downhand and fillet. The two Z-sections are assembled together on a rigid straightening jig, which mechanically positions the 25-ft lengths to trueness. Butt welding is done in a single pass against a copper back-up strip.

RECO is dexterous in weld jig design. Typical of its special jigs is the assembly and tacking fixture for obround basement tanks (Fig. 2). This is a vertical-structure frame jig with an in-out feed type of assembly frame to receive the work. The jig assembles shell and heads of the tank, holding the shell to dimensions. After shell and heads have been loaded into the fixture, a vertical air cylinder clamps the work for tack



4—HOOP-TYPE assembly and welding fixture with trunnion rolls was developed during war to rotate hulls of Mark IV tanks

5—INERT-ARC welding on the inside head seam of a large-diameter aluminum tank

welding. The vertical cylinder then retracts the top head of the jig, permitting its lower half to roll out from position to remove the tacked assembly. From this true fit-up, rolling hoops are assembled on the tank body (Fig. 3) to compensate for the obround shape. These are installed by clamp screw on each end of the tank. The work is then rolled onto floor trunnion rolls and revolved so that girth seams are welded in the down position.

The shop has an interesting method of scheduling by work center, and a pattern of crew production on "standard products." Departmental efficiencies have been greatly improved by the use of work-center loading and scheduling.

Power-Driven Rolls

A unique feature of the shop is its longitudinal and transverse floor installation of power-driven trunnions (Fig. 1). A shell can be placed on these trunnion rolls almost anywhere for welding of circumferential seams. The turning rolls will accommodate any diameter and length of tank.

The shop has better than 100 welders, 400 and 600 amp capacities. It uses AWS E-6010, E-6012 and E-6020 coated mild-steel electrodes for much of its mild-steel work. In single-pass welding, special fixtures are used with an automatic welding head.

Inert-Arc Welding

The shop also does much inert-arc welding (Fig. 5), using argon gas. The tungsten electrode is used in a manual welding technique, while filler rod is fed into the arc. At present, this process is employed for tanks of up to $\frac{3}{8}$-in. thickness of aluminum and on $\frac{3}{16}$-in. thickness of silicon copper and stainless steel.

Much welding is multipass on two sides. Double-vee butt welds are usually made on pressure vessel seams; lap welding is allowed on non-code work. Multipass welding follows the uniform rule of the boiler codes, one pass to $\frac{1}{8}$-in. thickness. The RECO standard on ASME code work is ten passes for plate of 1-in. thickness, with double-vee-beveled butt joints. Electrode sizes progress from small electrodes to start, up to the larger rod sizes.

The 460 by 68 ft welding bay is shown in Fig. 6. The bay has a 35-ft height under crane hook. In the right foreground of Fig. 6 are layout tables and hydrostatic testing equipment; in the left foreground are flame-cutting tables and the gate shear. In the central portion of the picture will be seen tanks of stainless steel, aluminum, copper silicon and mild steel after assembly for the finish welding of seams and connections. In the extreme background is the production welding assembly line for LPG systems, air receivers and hydropneumatic tanks. This production line contains all operations from assembly through complete welding and hydrostatic tests.

Shop superintendent, inspector and timekeepers are centrally located aloft along the welding bay, where they have a bridge view of the floor. Tool room and electric maintenance shop are under the superintendent's office at ground level. Virginia Electric & Power serves the plant with three 750-kva transformers, 440 volts secondary, 2,300 volts primary. Shop demand is approximately 600 kw.

Good Work Flow

Though the welding bay handles a great variety of tank sizes in both mild and alloy steels, its welding procedure has good line flow. Much of this is achieved because of the longitudinal and transverse trunnion roll installations. Flow is from the west end. The work comes first

6—WELDING BAY measures 68 by 460 ft. Tanks move through this department in a production assembly line concluding with hydrostatic tests

to layout tables, where the job is studied and laid out on benches for scribe lines and instructions to be placed on the actual plates. The work then proceeds to torch-cutting station or plate shear.

The shop generates its own acetylene gas. It uses both manual and automatic flame-cutting equipment. After the plate has been cut or sheared to size, it proceeds to bending roll or press brake for shaping.

Next station of the work is to the fit-and-tack work center. Shell seams are tacked; fittings and nozzles are installed. Near this station, a considerable area is reserved for welded assembly of standard products supports for bulk storage tanks and miscellaneous plate fabrication. The tacked and fitted shells are placed on the power-driven floor trunnion rolls for final welding of all shell seams.

The production line contains two test pit stations. The first is at the end of the pressure vessel production line and takes care of small pressure tanks up to 5-ft diameter. Hydrostatic tests up to 3,000 psi are made. The second station is serviced by a storage tank in the floor, which fills and drains for miscellaneous vessels, providing hydrostatic tests up to 2,000 psi.

The engineering department has worked out procedure specifications covering each type of welding for the materials fabricated. These have been manualized as standard practice, from which there can be no deviation. Specification WP-3, covering the "Procedure Specification for Electric Fusion Welding of Austenitic Stainless Steel," is actually a 24-page looseleaf booklet. Sketches appear therein to illustrate the salient procedure details.

The ASME Boiler Construction Code, Section IX, is strictly adhered to in qualifying this RECO procedure. Welding is done by the metal-arc process. Base material must comply with ASME Spec. SA-240 and ASTM Spec. A-240-44; covering grades A, B, D, S, C, T, M and type Nos. 410, 430, 304, 347, 321, 315 stainless. Welding rods must be of such composition as to match minimum requirements of base metal. Welding is done in flat, horizontal and vertical positions. Edges of the parts to be joined are prepared by shearing, grinding, chipping or powder flame-cutting and must be clean and free of all oil, grease, scale, dirt and rust. Beveling is accomplished as quickly before welding as possible.

The specification states that direct current shall be used with, in most cases, the base metal negative and the electrode positive (reversed polarity). Edge-preparation methods are detailed in sketches; electrode sizes, mean currents and voltages are given for various thicknesses.

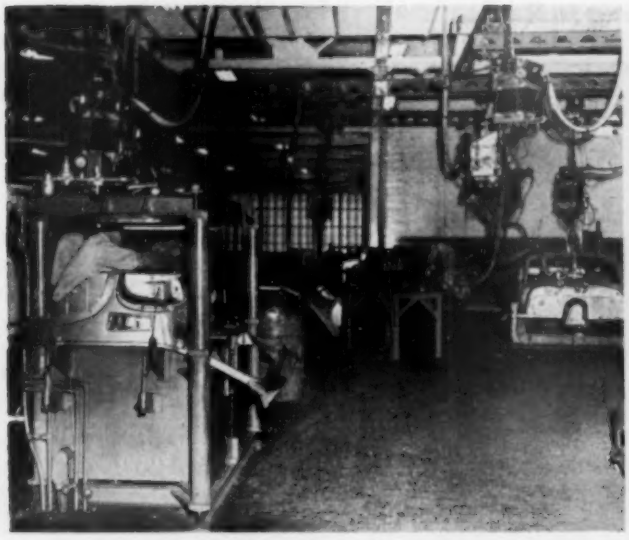
Cleaning and Peening

When a joint requires more than one bead, the preceding bead is cleaned by peening or by wire brushing with a stainless-steel brush to remove all oxide, scale, flux and slag inclusions before the succeeding weld is applied. Surface cracks and blowholes are ground or chipped. Peening is not permitted to repair pinhole leaks and cracks. When the material is not completely welded from one side, root of the initial bead must be ground or chipped to sound and clean metal before the opposite side weld is made. Test specimens are made for $\frac{3}{16}$, $\frac{3}{8}$ and $\frac{1}{4}$ in. thicknesses of stainless-steel plates; specimens are made for each welding position and for each ASME procedure number as depicted in a series of detailed sketches.

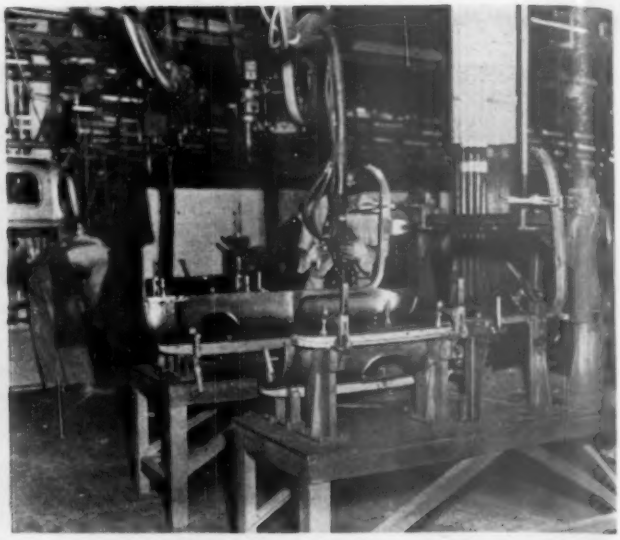
A table lists recommended electrodes of four manufacturers for welding types 410, 430, 304, 347, 321 and 316 stainless steels.

Before leaving this comprehensive manual, it might be well to say a word or two more about the sketches. A series of three illustrations shows edge preparation of solid stainless-steel plate, indicating preparation in relation to square, bevel and double-bevel edges. Eleven drawings depict welding details for various thicknesses of square-edge butt welds, single and double pass; single-vee and double-vee welds, multiple pass; fillet welds in single and multiple pass; stainless-steel welding with back-up strip. Finally, eleven sketches detail preparation of test specimens for procedure qualification.

The science and art of welding in structural fabrication is well exemplified by a side building attached to RECO, though owned and operated as a warehouse by another company. This 300 by 75 ft building has a 35-ft-high craneway under roof. It has an all-welded 75-ft truss span. Columns and trusses were jigged on the floor and position welded to eliminate stresses and warping. The 12 by 14 ft box-type supporting columns were welded from scrap plate left over from war contracts.



2—TRUCK CAB ASSEMBLY. At left, one of two fixtures for spot welding cowl to toe plate and dash. Instrument panel is being welded to cowl at right rear

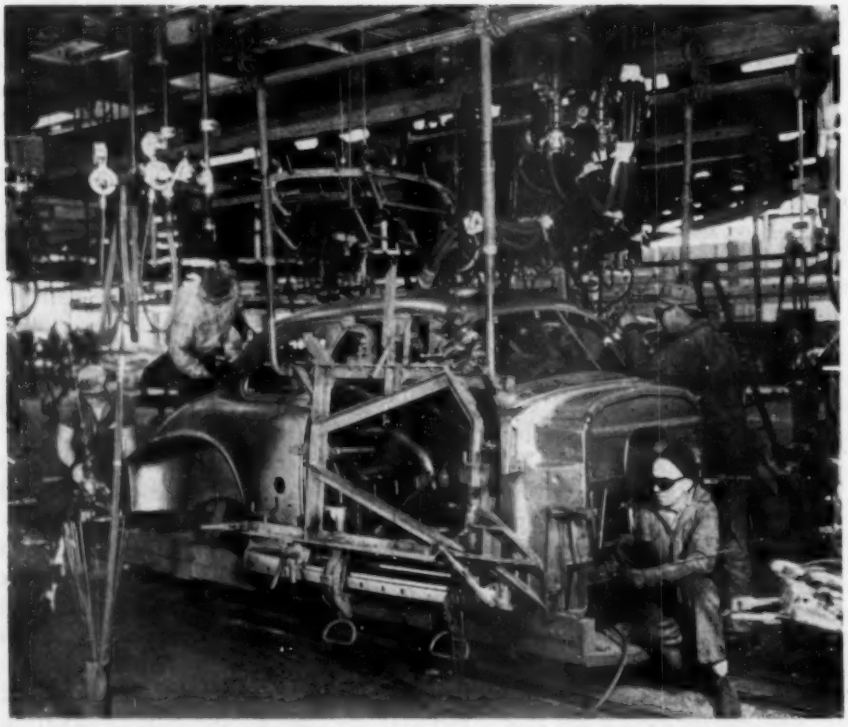


3—CAB INNER PANEL is being spot welded to the pillar posts of the door frame in fixture in the foreground. Cab framing fixture is in left background

Truck Cabs Welded

Arc, gas and spot welding are all employed for assembly of truck an pas

BY FRED M. BURT



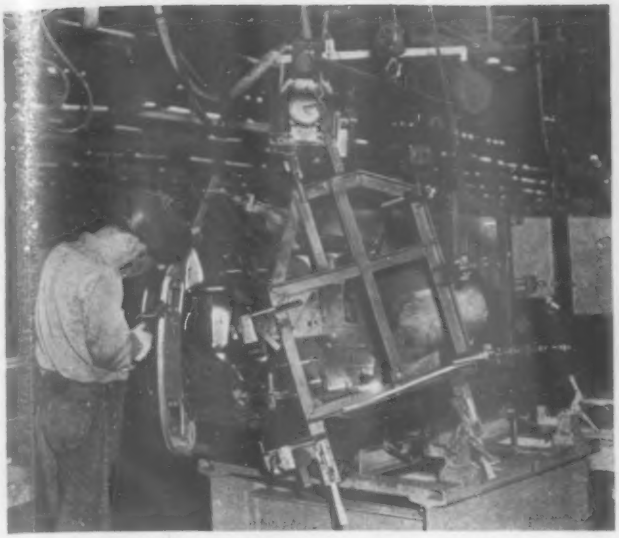
1—CHEVROLET COUPE being assembled on the Fisher Body side of the big Van Nuys assembly plant. Spot, gas and arc welding are all used

New Chevrolet Los Angeles assembly plant for passenger cars, trucks and commercial cars at Van Nuys, Calif., is in the center of the San Fernando valley, a 212 sq mi part of Los Angeles that has almost exactly the area of Chicago. This big plant, starting off with about a half-million-dollar monthly payroll, gives recognition to the ever growing requirements of the far-western market.

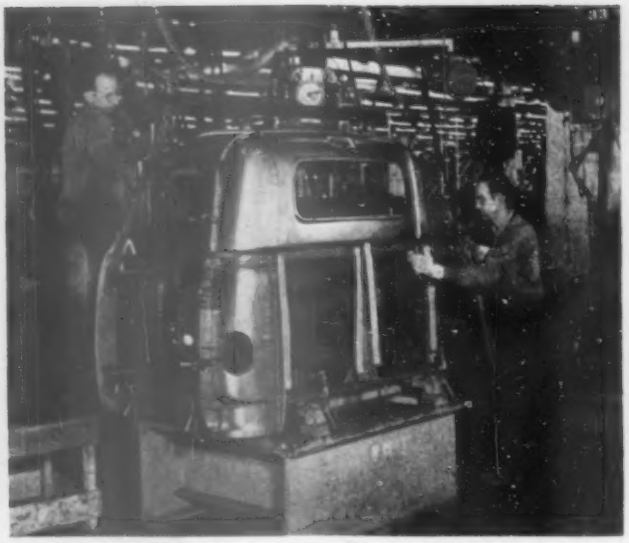
On 100 acres of property there are eight buildings and a total 915,292 sq ft of floor space. About one third of the floor area is occupied by the Fisher Body division for the assembly of passenger-car bodies. Commercial bodies, truck cabs and bodies are assembled on the Chevrolet side, where also the passenger cars are completed.

Fisher Body Assembly

The assembly of the passenger-car bodies on the Fisher Body side (Fig. 1) involves spot, gas and arc



4—**COWL SUBASSEMBLY** clamped on cab framing fixture. Cowl of panel truck is being arc welded to seat riser, following a much larger amount of spot welding



5—**CAB FRAMING** continues with addition of inner back panel to seat riser and cowl subassembly. Platform that holds the assembled cab is a precision fixture

ed on the Assembly Line

ck an passenger-car bodies at the big new Chevrolet plant at Van Nuys, California

welding and follows pretty much the same general processes that are used in the assembly of truck cabs, the principal subject of this article.

Information Telautographed

The methods employed in tying in the Fisher Body production and delivery of bodies with the Chevrolet production control are quite efficient and interesting. As each body leaves the end of the Fisher Body assembly lines, on its way by floor conveyor to Chevrolet, it passes a master telautograph station. The operator writes a description of the car body as it passes, transmitting the information electrically to ten substations at strategic points on the Chevrolet side. The Chevrolet overall assembly operation consists of putting together many subassemblies of different colors and styles. It is vital, therefore, that the operation of all feeder lines leading to the main assembly line be carefully timed and scheduled so that the proper colors and parts will meet at the proper time.

The plant has two miles of floor conveyor (including Fisher Body) and 3½ miles of overhead conveyors. The new "power and free" trolley conveyor system is used to provide a suspended assembly on the passenger-car chassis line. Just ahead of the first station on this line, there are two automatic spot-welding machines for the left and right chassis side members. Eighty of these members at a time are delivered on a steel frame by a heavy-duty fork truck and placed alongside each welding machine. The heavy member itself is a product of spot welding, the flat bottom section being attached to the deep channel by dozens of heavy spot welds.

Welding Chassis Members

Two men on each side weld six brackets on each member. In the left-side member welding machine, body bolt brackets, motor-mount support brackets and the emergency brake bracket are first laid on positioning pins that fit into the bolt or rivet holes. Then the side member is laid on them upside down. Four 100-psi compressed air rams, operated by a single push-button control, hold the member in place while the brackets are automatically spot welded to it. In case one weld is not satisfactory, individual controls for each of the four welding stations allow the imperfect weld to be supplemented without welding being done at all stations.

After a rear-spring hanger holding fixture is attached to one end with a suspended hydraulic riveting gun, the side member is lifted to the cooling rack. The whole operation requires about 60 seconds.

The welded side members are placed on cooling racks on each side of the assembly fixture, where the front axle, front A cross-member and the rear cross-member are attached. The carrier fixture then picks up the chassis to move it on to the overhead monorail conveyor.

Truck Cab Assembly

Moving up to the truck cab assembly line on the second floor, there are to be found many subassembly, welding assembly and other operations on both sides of and

on the long slat conveyor. This 120-ft conveyor will hold 15 cabs and is timed for that production capacity per hour. The department operates eight hours a day, five days a week, with from 40 to 45 specially trained weldors and other assembly men.

Batteries of Welding Guns

The slat conveyor travels from west to east. North of it, cowl subassemblies are made up in counter flow. Over this area there are two sets of parallel monorails, with bridges carrying about 13 welding guns to serve the several welding fixtures. The guns in this department include scissor guns, "C" guns and expansion guns, operated by compressed air or by compressed air with a hydraulic booster. They are counterbalanced by being suspended from spring balancers for easy raising and lowering.

At the first welding station in the outer row, east to west, the top cowl is welded to the lower side cowl. This is followed by a fixture where the cowl is welded to the toe plate and dash, and at the end the instrument panel is welded to the cowl. The inner line welds the top dash panel to the outer cowl rail and also has another jig for welding of the cowl to the toe plate and dash (Fig. 2).

Another set of monorails carries five bridges, with seven guns to serve. Looking south to north is a fixture where the inner panel is welded up from four parts, then another fixture (Fig. 3) where inner panels are welded to pillar posts. A little further on, opposite the loading end of the conveyor, is the cab framing fixture. Paralleling this double monorail line to the west is another line carrying seven bridges and guns for special welding assembly jobs.

6—ON CONVEYOR LINE, cowl is arc welded to the platform and seat riser. The toe panel is tack welded in five places to platform and riser

8—GAS WELDS in front and back of cowl complete spot-welded seams

Cab Framing

The cowl framing fixture can be used for both "suburban" and cowl welding. The cowl subassembly is placed on the fixture and clamped, followed by the platform and seat riser. These two units are then spot and arc welded together (Fig. 4). In the cab framing operation, the cowl assembly with the windshield posts is placed on the platform, which is a precision base fixture. The seat riser is added; gate fixtures are placed on each side to provide exact spacing for the doors; then the inner back panel is brought over from where it was welded to the door pillar posts and placed on the other side of the fixture. All parts of the back panel are clamped in exact position with about 20 quick-acting clamps (Fig. 5). These subassemblies are spot welded together at many points with dozens of welds and arc welded at a few points where spot welds cannot be made properly.

On Floor Conveyor

The cab is picked up by a 1,000-lb hoist that travels on a 40-foot rail and is placed firmly on the cab floor conveyor, where it fits fixtures that project outwards and upwards at

7—CAB TOP and back panel are spot welded together at table, located opposite the station on conveyor line where the subassembly will be needed

9—SOLDERING provides a smooth surface over the joints and weld spots

regularly spaced intervals from the steel conveyor slats. Immediately, other cowl and panel assemblies succeed the welded unit on the cab framing fixture to keep production moving as scheduled.

First operation on the floor conveyor consist of arc welding the cowl to the platform and seat riser with a 5-in. bead. The pillar post is also arc welded to the platform and seat riser, and the pillar post to the windshield post. The toe panel is tack welded to the platform and seat riser in five places (Fig. 6).

Top and Back Panel

Beside the next welding station (Fig. 7) is a table with precision holding fixtures and eight clamps. Here the cab top and the lower back panel are clamped. The abutting strips to be spot welded together are brought into exact alignment by the insertion of two long pins through holes in each strip. About 50 welds are made.

This assembly is then brought to the line and placed on the cab. It is positioned exactly with gates, steel straps and clamps. Then the back panels, top, door and windshield pillars are all spot welded together.

At the next station, four gas welds are made in the front (Fig. 8) and two in the back on each side of the cowl. The welds around the door are also smoothed down with an air hammer.

Next is a little more spot welding under the rear panel. To provide a perfectly smooth surface over the joints and weld spots, soldering is done as in Fig. 9. At the next station, the drip molding over the door opening is spot welded to the top.

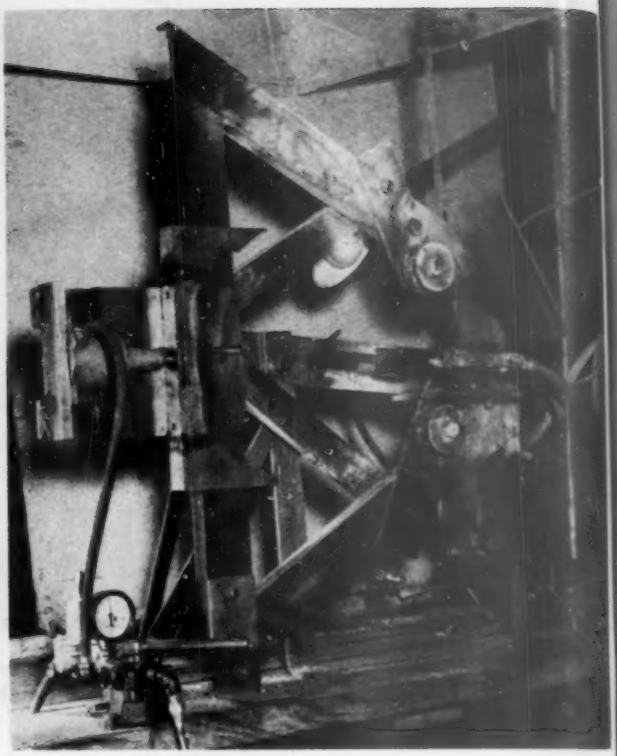
Other Assembly Lines

In the meantime, work has started on other conveyor assembly operations—door hardware, doors and other parts. Inspection turns up any welding imperfections, and these are reworked by an all-around weldor equally competent with spot, gas or arc welding. Another set of parallel monorails runs above the conveyor to carry bridges and various types of welding guns to serve every welding station.

Elaborate soldering operations are carried on here to create the necessary smooth body surface of cabs as required. Two large overhead conveyors cut across the conveyor line to deliver doors and other parts. All parts not delivered by overhead conveyor are brought to assembly stations on steel racks carried by fork trucks. At several stations the sheet-metal parts are given finishes by filing, grinding and buffing.

Suburban and panel bodies are assembled at a nearby location by a separate crew of men. The assembly progresses as the unit is moved over a pit, the work being done from below. Overhead rails carry spot-welding guns; portable arc and gas welding equipment is nearby. Parts are delivered by overhead conveyor or by fork truck, and the completed units are placed by hoist on overhead conveyor carriers to be transported through further assembly, cleaning, painting and baking.

1—EXPANSION FIXTURE forces ends of the tubular ring apart to permit entry of aligner and brazing ring



2—JIG for holding tubular workpiece. Split-ring welding head appears on right with hand crank and cam

Mechanized Tube

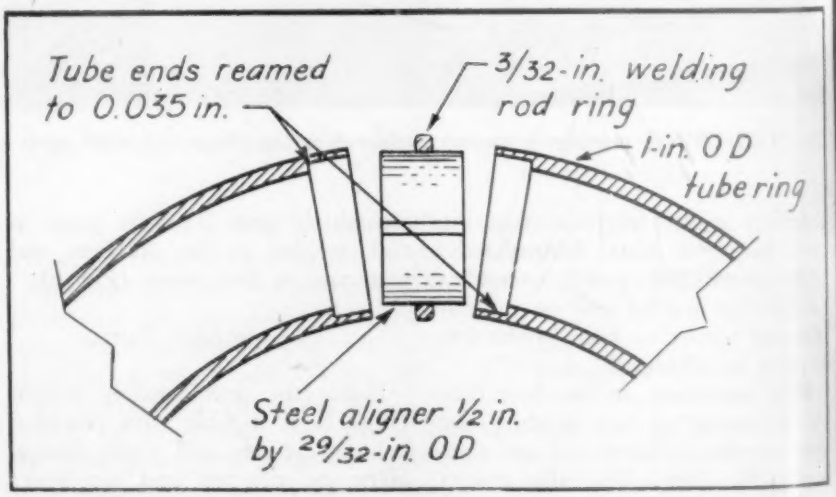
BY PHIL GLANZER

Novel set-up for oxyacetylene brazing speeds production of tubular rings for bar stool footrests. Brazing ring is held in place by a steel "aligner"

THE alignment of tubing for welding and brazing operations is often a bottleneck in the production line. A manufacturer of bar stools devised an ingenious set-up for aligning and brazing bar stool footrests. The operation is in two steps. First, an aligner and a ring of fluxed $\frac{3}{32}$-in. bronze rod are inserted between the ends of the ring of tubing. Next, a $1\frac{11}{16}$-in. ring-type heating head is moved laterally across the joint.

FIXTURE CONSTRUCTION

The set-up consists of two separate assemblies—the fixture for placing the aligner and brazing ring and the welding head. The first (Fig. 1) is a hand-operated fixture, which is used to expand the tube ring and



3—TUBE ENDS are reamed to dimension given in above sketch to permit insertion of the $\frac{29}{32}$-in. OD aligner. Brazing ring fits over the aligner

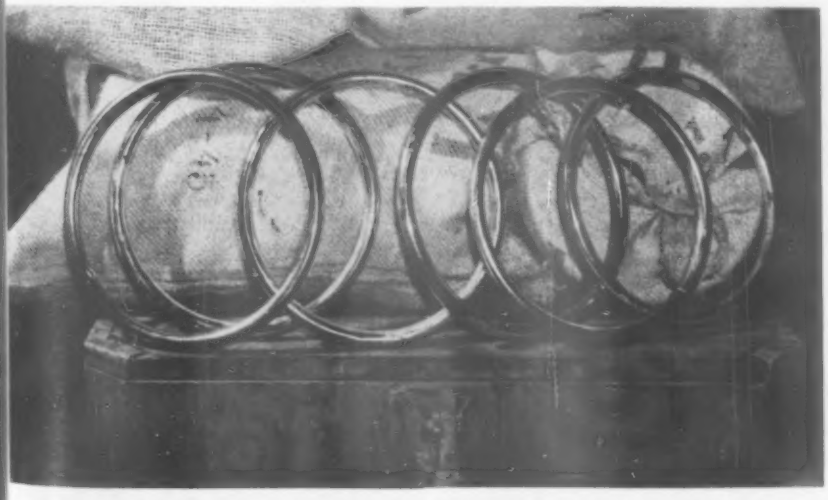
3—BRAZING IS DONE by oscillating ring-type oxyacetylene welding head back and forth across the joint by means of the hand-operated crank

Brazing

permit the aligner and brazing ring to be inserted between the ends of the tube.

The second assembly is the welding jig. The details of construction of the steel framework and braces are shown in Fig. 2. It is mounted on a sturdy bench top, and a vise-like arrangement operated by compressed air holds the ring steady in the welding position and presses the tube ends close to the brazing insert. The air pressure is controlled by a valve.

A water-cooled, split-ring-type welding head (Fig. 3) provides the heat for brazing. A manually operated crank and eccentric cam moves the welding head slowly back and forth across the joint. This oscillation permits the use of a smaller head and assures even distribution of heat. A double shut-off valve enables the operator to shut off both the oxygen and acetylene supply simultaneously without having to turn separate valves and upset the oxygen-acetylene ratio. The flames are quickly lighted by a gas pilot light.



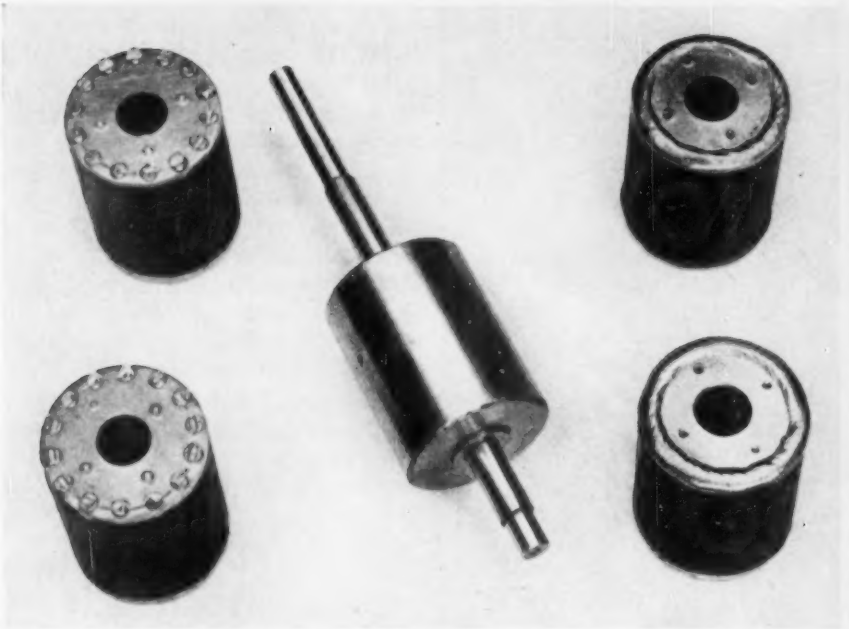
5—COMPLETED RINGS are chromium plated and buffed to a high polish. The rings shown are ready to form the footrests of tubular bar stools

Welding Operation

The tubing from which these stool footrests are made is 1-in. OD low-carbon-steel tubing with a 0.050-in. wall. Before the tubing is shaped to form a ring, both ends of the tube are reamed to 0.035-in. wall thickness so that the aligner can be inserted (Fig. 4). The aligner is a ½-in. long section of steel tubing having an OD of $^{29}/_{32}$ in. The $^{3}/_{32}$-in. brazing rod is cut to proper length and coiled into a ring that is slipped over the aligner. The aligner and welding rod ring are then dipped in flux and inserted between the tube ring ends as shown in Fig. 4. Aligner and ring together make up the full 1-in. OD of the tubing. The fixture shown in Fig. 1 is used to expand the ring until the aligner can be fitted into place.

The operator then sets the tube ring in the welding machine and locates it in the welding position before he turns on the air pressure. The split rings of the welding head are locked together, and the head is lighted by turning on the gas valve. The operator then turns the eccentric cam crank manually in order to move the welding head across the joint. He continues the oscillation until he sees that the brazing ring is melting. At this point a valve is used to shut off the flame.

The entire welding operation is completed in 24 seconds. After the ring cools, it is chromium plated and buffed and is ready for the bar stool assembly line. Some of the completed rings are shown in Fig. 5.



1—ASSEMBLED ROTORS (left) consist of steel laminations held between heavier copper end plates. The fourteen longitudinal copper bars complete the squirrel cage. On the right are two welded rotors. Rotor shown in the center has been finish machined and mounted on its shaft

2—RACK AND RACK ARM enable the electrode holder to move both vertically and laterally. Carbon pencil in foreground starts arc

3—FIREBRICK FURNACE on operator's left preheats parts prior to welding. Operator takes part from furnace and places it on spindle below the electrode holder. The welded part goes into tote box at operator's right. Its successor is preheating and will be at exactly the right temperature for welding when the first part has been finished

Copper Parts Production Welded

Helium-shielded arc welding is the key to mechanized production of rotors for induction motors. Copper bars must be joined to circular end plates to form an electrically homogenous squirrel cage

BY H. A. HUFF, JR.

Welding Specialist, Technical Sales Division, Air Reduction Sales Co.

Availability of the inert-gas-shielded arc-welding process as a mechanized operation has opened up widespread new uses in production. Inert-arc welding not only produces joints of excellent soundness, but it permits the welding of such "special" metals and alloys as aluminum and stainless steels without flux and hence without the problems resulting from slag or flux inclusions.

Among the metals to which the process may be applied is copper, one of the metals most difficult to weld. An ingenious application of helium-shielded arc welding has been developed by Salkover Metal Processing of New York, Inc., to enable the fabrication by mechanized means of rotors for induction motors.

Squirrel-Cage Construction

Salkover works as a specialized subcontractor in metal processing. The rotors are delivered mechanically assembled to the Salkover plant at Long Island City, N. Y. Each consists of laminated 26-gauge steel plates held within a "squirrel cage" composed of fourteen longitudinal copper bars and two relatively heavy copper end plates. The projecting ends of the bars are mechanically clinched, leaving a row of irregular bumps over 1/16-in. high around the periphery of each end plate. The contour of the ends of the rotors is, therefore, highly irregular, as may be seen from those pictured at the left of Fig. 1.

Because of the high relative content of copper and the arrangement of the copper parts, a considerable problem is created by the metal's high heat conductivity. This makes it advisable to preheat the parts before welding. Though they could probably be successfully welded without preheating, the efficiency of the operation would doubtless be sharply reduced. And it is the high degree of efficiency—based largely on machine operation—that is the key factor of Salkover success with this job.

Rotation and Adjustment

The rotors, each measuring about 2 in. in diameter by 3 in. long, are rotated under the welding head on a power-driven spindle that positions and turns the workpiece. A rack arm and a rack-type cutting-torch fitting (Fig. 2) permit both lateral and vertical adjustments of the electrode holder. These adjustments take care of the general positioning requirements for welding and also allow the operator to provide for the irregularities of contour from part to part.

The set-up has been planned to provide the most efficient work pattern possible. City gas preheats the rotors in the small firebrick oven at the operator's left (Fig. 3). In front of him is the welding table, and the positioning controls are at his right. The operator takes a preheated rotor from the oven and places it on the spindle. The holder for the 1/8-in. tungsten electrode is positioned, and the arc is started by means of a carbon pencil.

Fusion is completed in two revolutions, using 150 amp, d-c, with helium as the shielding gas. Meanwhile, another rotor is preheating. When one end has been fused, the part is reversed on the spindle. The job is completed with another two revolutions, and the finished rotor placed in a tote box. The operation is so timed and adjusted that as soon as one part has been finished the part in the preheating furnace is at exactly the right temperature for welding.

In a simple, highly efficient pattern of movement, the finished part is removed, a preheated one placed, the arc struck, and a new part set in the oven for preheating. So smoothly organized is the motion pattern that, even with three separate handlings of each part, over one rotor a minute is completed. In spite of the problems presented by the part and its construction, the reject rate is extremely low, far less than 1%. While part of this efficiency must be credited to good planning and operating skill, it is also characteristic of soundly applied inert-arc welding.

900 Parts per Helium Cylinder

Unusual economy is effected in this operation at the Salkover plant. Not only is production rapid and rejects few, but an average of 900 welded parts per cylinder of helium is achieved without loss of effective gas shielding.

The finished product, as Salkover delivers it, shows a slightly rippled bead around each end (Fig. 1, right). In Fig. 1, center, the manufacturer of the motors has machined the welds to finished form. The typically sound, clean fusion becomes readily apparent.

One reason for the success of this application of helium-shielded welding is the thoroughness with which the process was fitted to the job. Often, only a little extra brainwork means the difference between partial and complete success. In this instance, welding procedures, operator training and costs were all carefully considered, and the result is a completely successful application of mechanical inert-arc welding.

Acme photo

SMOKE RISING from burning oil processing plant in Oklahoma gives the effect of billowing clouds. This fire was started by welding carelessness

Big Fires Grow from Little Ones

But fires can't grow if the right type of extinguisher waits in the hands of a man trained to use it. Nor can they start from welding and cutting equipment that is properly operated

BY MARC MALONEY

NATIONAL Fire Protection Association reported more than 30,000 industrial fires during 1947 that damaged or destroyed property. Cost of these fires was estimated to exceed 100 million dollars.

One fire alone, attributed to sparks from an oxyacetylene torch, did damage estimated at $100,000 to a St. Louis foundry and machinery plant. This fire went out of control because an employee did not know how to use the fire extinguisher he had grabbed to put out the flame.

Sparks from the torch ignited oily rags on the floor. It was, of course, inexcusable carelessness to use the torch in the vicinity of such rags. The flames spread to a fuel-oil tank which exploded, cascading flames to a compressor room on the first floor. One workman grabbed a carbon-dioxide fire extinguisher, but when he discharged it to put out the fire the carbon dioxide gave off its customary explosive roar. The workman became frightened, dropped the extinguisher and ran for safety. The fire chief said the extinguisher could have put out the original fire if it had been properly used.

Oil Refinery Fire

On the very same day a fire raced through a refinery plant in Oklahoma City and virtually destroyed property valued at $250,000. It started when a weldor who was repairing equipment in a grease storage building tossed a white-hot fragment of welding rod on an inflammable box. The whole building was a mass of flame in less than three minutes.

Thus in one day $350,000 fire damage was caused in only two plants because of carelessness in welding operations and because of lack of know-how in fire protection.

Welding is not a major cause of fires in industry. Open flames, which include welding and cutting torches, started 9% of industrial fires in 1947. Yet this seemingly small figure accounted for more than 5,000 fires at an approximate cost of nearly a million dollars. Enough to build a sizable manufacturing plant, fully equipped for business.

Even this is a light comparison. When one stops to think of other losses—men thrown out of jobs, medical costs and the rebuilding and replacing of structures and equipment—the damage is two to three times greater.

Most welding fires start because of carelessness; use of welding apparatus is not in itself a serious fire hazard. It is clear, however, that greater emphasis must be put on safety rules if industry is to stop having fires originating from welding.

Employees of one factory were welding inside a fermentation tank. The cork insulation of the tank was ignited and slowly spread over a large area beneath the magnesium covering before being discovered.

FIRE-FIGHTING DRILLS serve to train employees. Approved fire extingnishers should be located wherever welding operations are in process

Obviously, the insulation should have been removed. This is only one example of the type of carelessness that has caused fires to be attributed to welding.

Watch Cutting Sparks

The sparks and molten metal from flame-cutting carry farther and are more likely to ignite combustibles than those from welding. The sparks from cutting, which are actually molten metal, are thrown off in a shower for distances sometimes reaching 25 or 30 feet. These sparks retain enough heat for a few seconds to serve as a potential source of ignition. Often, smoldering fires are started and not discovered until they are out of control.

Welding and cutting in most industries is a special operation and should be treated as such. To insure greater safety, safety experts of the Fire Insurance Association suggest that permits be issued to control the operation.* All welding or cutting should be restricted to a predetermined area and before portable units may be moved, the written consent of a competent official should be secured. The location should be closely inspected by the official before he signs the permit.

No equipment should be permitted to be used in the presence of flammable liquids, vapor or tanks which have previously contained flammable liquids. Floors and surroundings should be swept clean and wet down and all combustibles should be moved 30 to 40 feet away. Any combustible that cannot be removed should be covered with asbestos curtains, metal guards or flameproof covers—not ordinary tarpaulins.

All welding and cutting equipment should be kept in good operating condition at all times. Soapy water is recommended in testing hoses for leaks.

Extinguishers Must Be Ready

Approved fire extinguishers should be on hand to cope immediately with any fire that may flare. When welding or cutting operations are in combustible buildings, a man with a fire extinguisher should be stationed on the floor below, possibly one on the floor above also. The areas on which the operation is performed, including the floors above and below, should be patrolled for at least half an hour after the work is completed. If work is completed near the shut-down period, the oncoming shift or watchmen should be notified.

Fire protection is more than hanging up a fire extinguisher. The man who dropped an extinguisher that could have put out a fire reminds us of the need to teach employees about fire protection. Trained men, backed by approved fire-fighting equipment, will be able in most cases to take care of fires while they are still controllable. Employes should know what fire extinguishers to use on different fires, and it is the responsibility of management to see that the right fire extinguishers are installed in the right places.

In areas where fires could originate in wood, trash or similar combustible material, fire extinguishers containing soda and acid, foam or loaded stream (chemical liquids expelled by carbon dioxide cartridges) should be installed. For fires that may flare from flammable liquids, oil or grease, fire extinguishers should contain dry chemicals, carbon dioxide, vaporizing liquid or foam. In areas where electrical fires are possible, the use of non-conductive agents are recommended. Dry chemicals, carbon dioxide and vaporizing liquid will not conduct electricity.

Keep Equipment Charged

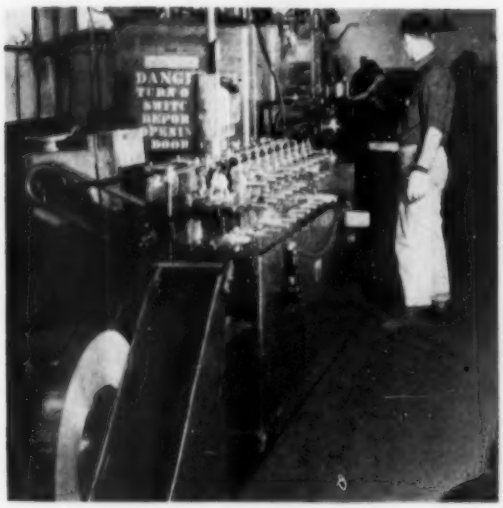
Training men to use this approved equipment properly cannot be overstressed. Many industries have organized fire-fighting brigades, which, in many cases, have obtained a speed and efficiency in combating fires approaching a team of professional firemen.

Not to be overlooked is the maintenance of these vital fire-fighting devices. Trying to fight a fire with defective weapons is the same as facing an enemy with an empty gun! Every piece of equipment should be inspected once a year for defects. Several types of fire extinguishers such as foam and soda acid need to be recharged every year. The yearly inspection is often a good time to put on fire-fighting demonstrations for employees since the old charges may be exhausted without extra cost.

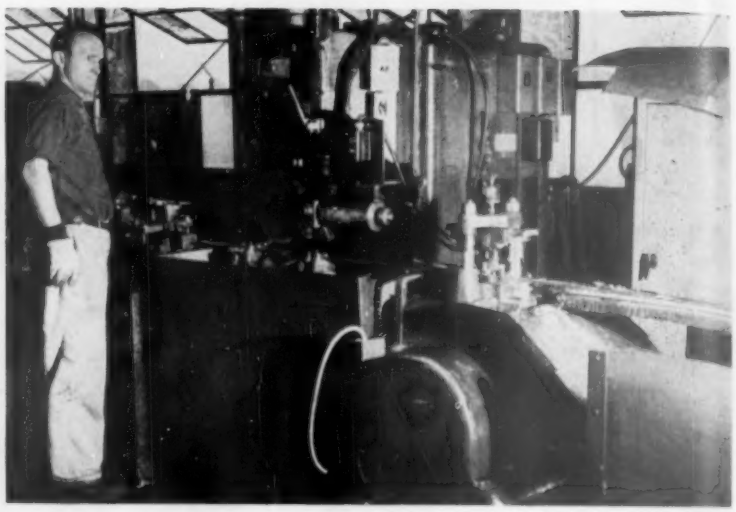
Big fires can grow very quickly from little ones. Don't be a fall guy for a flame! Fires are playing for keeps.

*The editors of The Welding Engineer cannot wholly agree with this suggestion. "Operation by permit" would impose bureaucratic red tape on the use of welding and cutting equipment. It is the editors' belief that a program of education to inculcate a proper appreciation of the fire hazard among users of welding and cutting equipment will accomplish more than compulsory restrictions.

WINDOW SCREENS



1—SCREEN RAILS are formed from strip



2—SEAM WELDING screen rails. Rails are cut off automatically

Screens, Doors and Hoops

BY WALTER RUDOLPH

All common resistance-welding processes are employed at Johnson Metal Products to make such diversified products as frames for doors and windows and steel barrel hoops

Spot, flash, projection and seam welding figure largely in the efficient production of metal-frame window screens, metal-frame doors, barrel hoops and diversified articles at Johnson Metal Products Co., Erie, Pa. This firm claims world leadership in "Fenestra" screen output since 1930. Everything made goes to Detroit Steel Products Co.

Screen Production Lines

Three screen production lines flow through the plant, beginning at the east end where rolls of steel strip are received. Gauge and width of the stock vary. Some rolls are processed by a slitting machine prior to being placed in racks beside roll-forming equipment.

Screen rails—the sides and top and bottom pieces of the frames—vary considerably according to the

BARREL HOOPS

5—HOOPS are formed in coils, cut off individually in a punch press

6—PROJECTION WELDING adds lugs

3—**FLASH WELDING screen frames. Vertical V-shaped fixtures hold rails**

specifications for screen lots. After the rails emerge from the roll former (Fig. 1), they are seam welded by the machine pictured in Fig. 2. A few feet away in line with the seam welder is an automatic cut-off machine. The welded rails then drop into an open-end cart for movement to flash-butt welders.

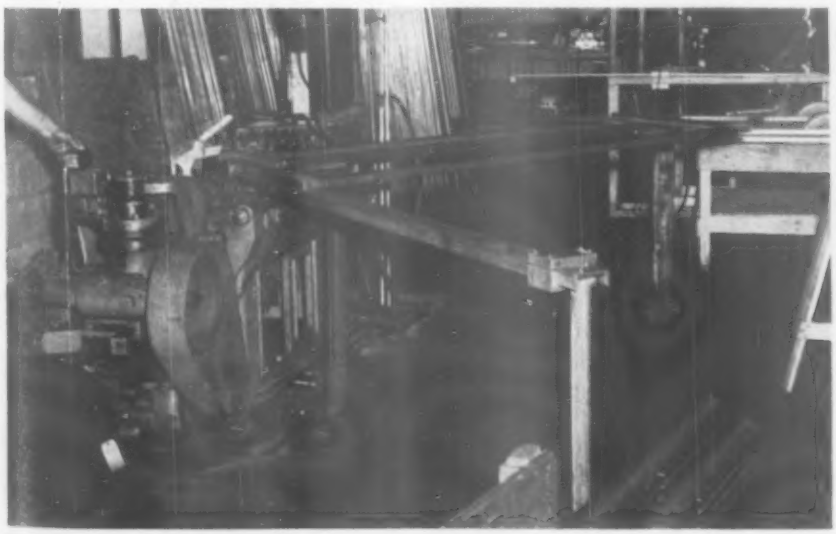
Two of the latter machines (Fig. 3) are positioned near the end of the roll former and seam welder unit. They are fitted with vertical V-shaped fixtures to hold the rails for butt welding. Adjustable rail clamps provide for adaption to various lengths of rails. With this equipment, operators can weld the rails together as fast as they can place and clamp them.

A sanding machine removes the extruded metal and smooths the corner unions. The operator of this machine hands the sanded frame to an inspection station where it is tested for rigidity and alignment. The inspector then places the frames against a small fixed drill to make drain holes for rain in the screen's bottom rail.

Now in the blueprint stage are plans for conveyorization of the screen frames from this point through the finishing department for bonderizing, spraying and/or dipping and finally passage through an infrared lamp baking oven to be suspended overhead.

Fitting and installation of the screening still remains a job for highly skilled labor. A number of work tables are in the area next to the finishing department for this final stage of screen manufacture. Johnson Metal Products is experimenting to develop machinery that will eliminate or at least speed this costly assembly labor.

DOOR FRAMES



4—**DOOR RAILS are flash welded together in a horizontal V-shaped fixture**

Door Frame Manufacture

Metal-frame doors follow a slightly different production procedure. From the roll formers, the door rails move to spot welders, where spots spaced several inches apart are placed around the entire inside edge of each frame component. The rails are then clamped in a fixture (Fig. 4) similar to the V-shaped fixture for screen rails but horizontal instead of vertical. Both types of fixtures hold the rails at right angles for butt welding of the corners.

Doors are finished off in the same manner as window screens.

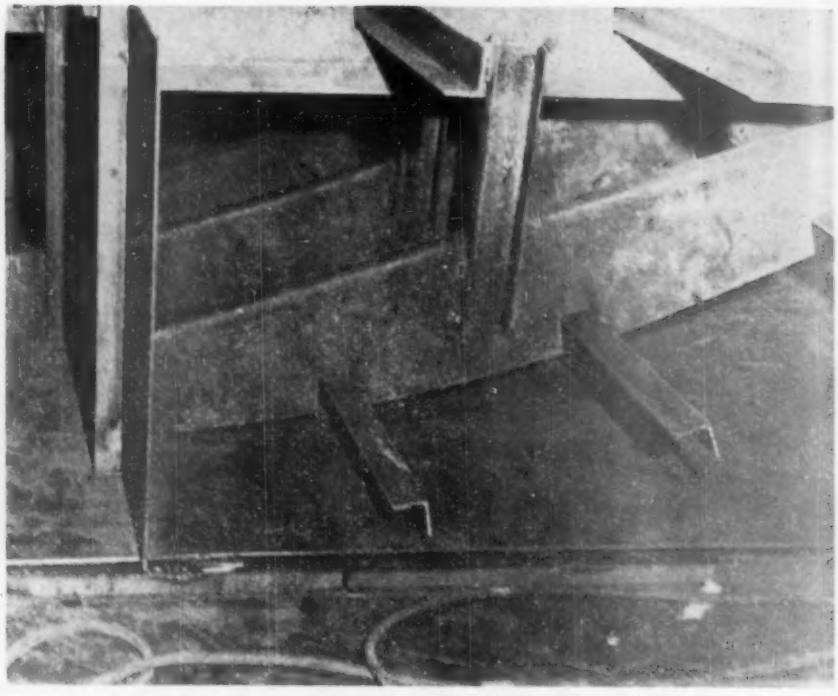
Barrel Hoops

Steel barrel hoops are produced in a variety of sizes or diameters by two methods. In the first method, one hoop is formed at a time. An 18-in. hoop, for instance, emerges from a specially adapted head that curls the metal strip into a semitube that is automatically cut off at the set circumference. The hoop thus formed is hung on a mobile rack and eventually moved to a fixed projection welder.

In the second method, another type of former curls a section of strip into a coil that will make ten separate hoops. The individual hoops are then cut off in a punch press specially adapted to this purpose (Fig. 5).

Lugs must be projection welded on the hoop to permit it to be tightened around a barrel by means of a nut and bolt. How this is done is shown in Fig. 6. The two lugs for tightening are placed in the jaws of the projection welder on top of the hoop ends, which fall just short of meeting each other. Upon completion of the weld, the hoop is hung on a rack for movement to the finishing department or packaging.

1—IN THE SHOP, deck plates are being tack welded together



2—CONSTRUCTION DETAIL of bow. The 13-ton quarter sections are assembled by tack welding in the shop and then hauled to the launching ways

Welded Scows for Alaska

"Quarter boats" built away from the water front turn into steel fishing scows through the magic of welding

BY MARGARET RALSTON

WELDIT Tank & Steel Co., Bellingham, Wash., which makes about two thirds of the steel scows built in the Pacific Northwest, has perfected an interesting method of constructing all-welded fishing scows and barges. The boats are built in quarters and later assembled on the water front.

CONTRACT FOR SIX

Weldit followed this method in a recently completed contract for six such vessels, each 72 ft long by 24 ft wide by 6 ft deep in the center. These scows were built at a cost approximating $130,000 for the Loman Commercial Co., Nome, Alaska, and the Alaska Packers Association, Blaine, Wash.

The slightly higher cost of the steel scow over wooden vessels is more than offset by the ease of cleaning and reduced maintenance costs effected through the elimination of caulking, frequent painting and replacement of rotted timbers. These various advantages have rendered the steel scow popular on the Pacific Coast within the last few years. Nevertheless, the use of steel for scows destined to fish Alaskan waters marks a radical departure from the wooden barges that are ordinarily used.

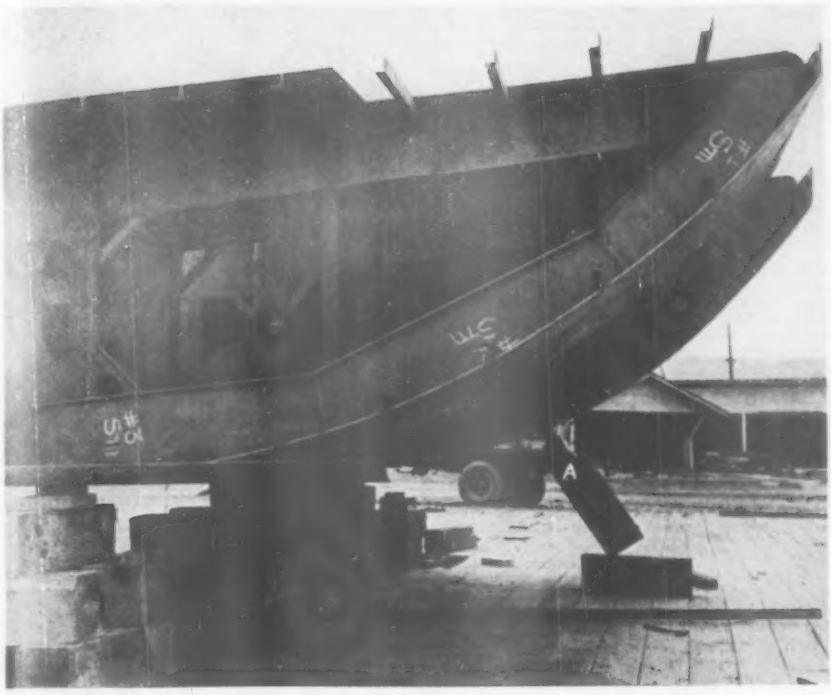
TACK WELD ASSEMBLIES

The six scows just built by Weldit were made by tack welding together quarter sections in the shop (Fig. 1) and hauling these prefabricated assemblies to the launching ways for the completion of welding. Since the quarters were only tack welded together, they were much easier to align on the ways than if the welded seams had been completed. The welding procedures and sequences followed were said to eliminate all warping and confine locked-up stresses to the outside of the hull, not within the structure.

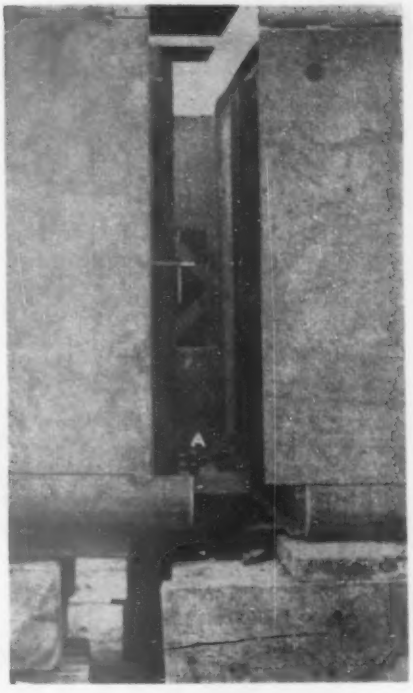
PLATE THICKNESSES

Each of the quarter scows measured 36 ft long by 24 ft wide. For the most part, plates 30 by 7 ft were used in the hulls. This large size proved the most practical since the fewer the welds the less chance of distortion. Bottom plates were $\frac{5}{16}$ in. thick, side plates $\frac{3}{8}$ in., deck plates $\frac{1}{4}$ in.

The scows have one longitudinal bulkhead and three bulkheads athwartships. For general framing and bulkheads, angles 2½ by 3½ by ¼ in. were spaced at intervals of 20 and 24 in. Angles 3 by 4 by ¼



3—BOW SECTIONS are aligned on blocks at launching ways, preparatory to final assembly welding. Hydraulic jack is located on block at point A



4—SCREW JACK (shown at A) pulls sections together amidships

in. were used for sides and bow sections (Fig. 2). Baffle plates were ¼ in., and girder plates ¼ in. thick by 24 in. wide.

Obviously, fabrication within the shop is much easier than construction on the open ways. The trick was to make the prefabricated sections as large as possible, yet keep them readily transportable. No difficulties were encountered in the transportation of the 13-ton quarter sections to the launching ways. This successful venture would seem to indicate that it is wholly feasible to prefabricate scow sections some little distance away from the launching point.

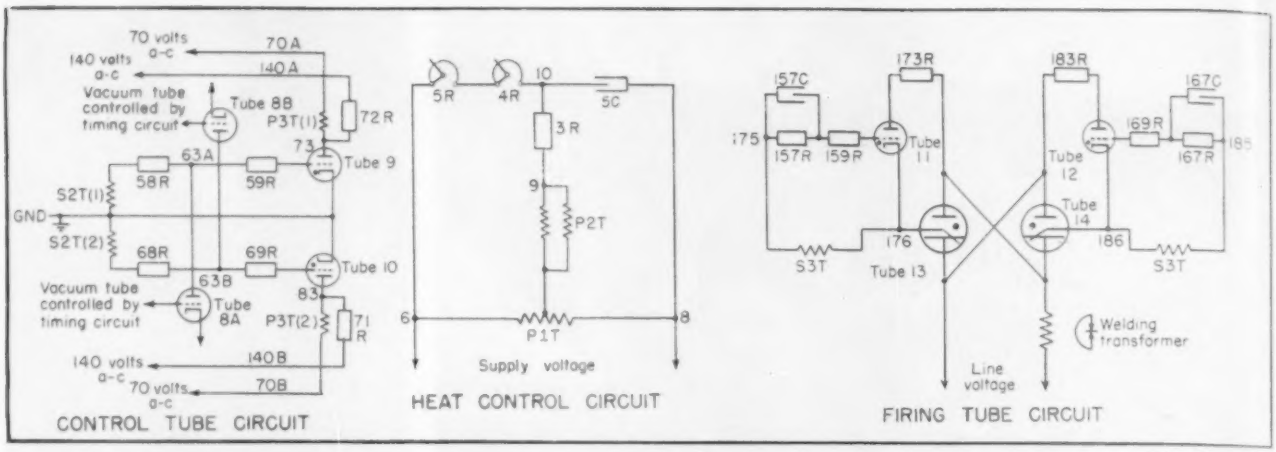
Pieces Put Together

Final assembly of the six scows was completed at the Commercial Point Shipyards, Bellingham. The sections were unloaded onto blocks (Fig. 3) near the ends of the launching ways and pulled together by hydraulic and screw jacks (Fig. 4). After alignment, final welding proceeded both from within the hull and from outside (Fig. 5).

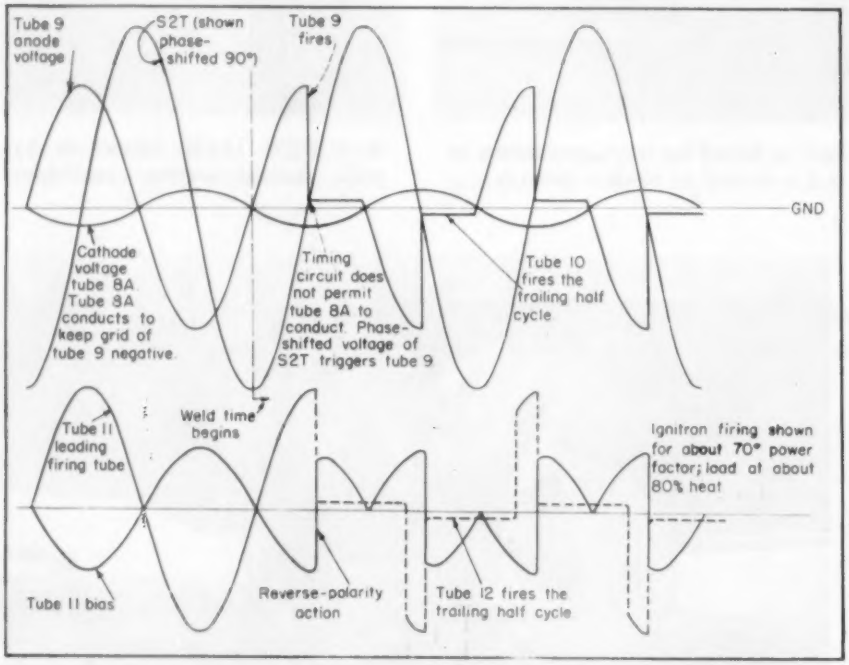
5—ON THE WAYS beside salt water, a worker welds the bottom plates as the 72-ft steel fishing scow nears completion for her Alaskan voyages

Prefabrication required, roughly, two weeks per scow. Alignment of the sections for welding took two to three days. Final welding was ordinarily completed within another three days, making a total construction period of around three weeks. About 90% of the electrodes consumed were of 3/16-in. sizes.

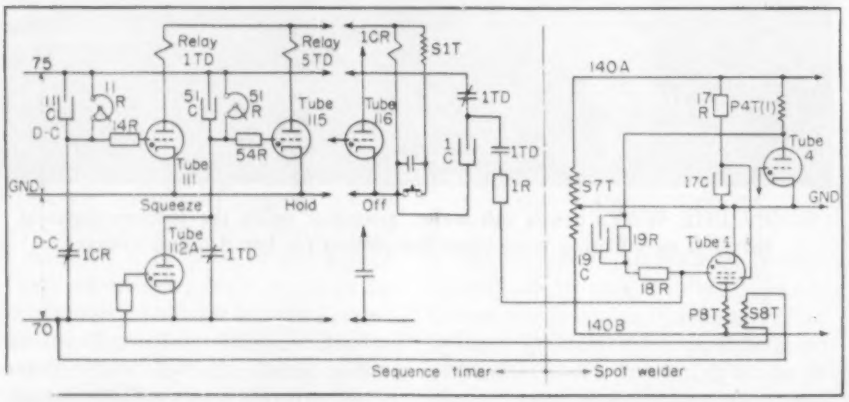
Conclusion to be drawn from this operation by Weldit is that prefabrication by tack welding and the hauling of 13-ton sections to an assembly point at salt water have proved entirely feasible. The launching ways for this type of vessel need consist of nothing more than skids sloping down to the water.



1—CONTROL TUBE CIRCUIT is regulated by timing circuit of spot or seam welding control. Thyratron tubes 9 and 10 fire only during the on-time when secondary of transformer 2T swings positive. Heat control circuit offers stepless heat adjustment. Firing tube circuit has one transformer which performs reverse-polarity action


Tube 9 anode voltage
S2T (shown phase-shifted 90°)
Tube 9 fires
GND
Cathode voltage tube 8A. Tube 8A conducts to keep grid of tube 9 negative.
Timing circuit does not permit tube 8A to conduct. Phase-shifted voltage of S2T triggers tube 9
Tube 10 fires the trailing half cycle
Tube 11 leading firing tube
Weld time begins
Ignitron firing shown for about 70° power factor; load at about 80% heat
Tube 11 bias
Reverse-polarity action
Tube 12 fires the trailing half cycle

2—WAVE SHAPES of tubes 9 and 10 (refer back to Fig. 1). Grid voltage of firing tubes 11 and 12 shows reverse-polarity action during weld time



3—SEQUENCE TIMER initiating circuit for NEMA type 7-B timer. In the 7-B timer, the spot welder tube, tube 1, will fire only at the beginning of its positive anode voltage after capacitor 1C is discharged

New E

★Part Three—Control Fea

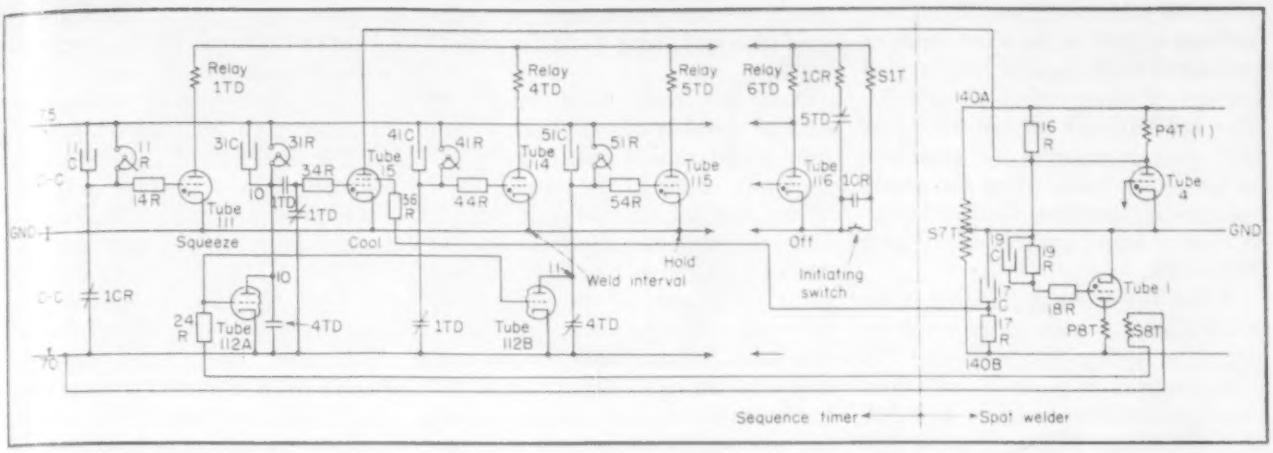
BY B. SUSSMAN

Control Engineering Division, General Electric Co.

PART I of this article discussed the basic timing circuits of resistance welding, and how they were put to work in the non-synchronous types of control. In Part II the writer took up the application of the basic circuits to the synchronous precision type of control and described the operating details of typical circuits for the control of spot and seam welders. The present and final installment continues with synchronous precision timing circuits.

Control Tube Circuit

Both the timing circuit of the spot-welding control and the timing circuit of the seam-welding control (Part II: October WELDING ENGINEER) regulate a "control tube circuit" (Fig. 1). The grids of thyratron tubes 9 and 10 are operated by vacuum tubes (8A and 8B) and one secondary winding of transformer 2T. The vacuum tubes 8A and 8B are controlled by the timing circuit so that they conduct during the off-time or cool-time and are nonconductive during the on-time or weld-



4—IN 9-B SEQUENCE TIMER initiating circuit, a thyraton tube, tube 15, is employed to initiate the spot welder

Electronic R-W Controls

Features and Sequence Timers for Synchronous Precision Timing

time. Thus, when the vacuum tubes conduct (off-time), the grids of the control tubes 9 and 10 are negative. When the vacuum tubes are nonconductive (on-time), the grids of the control tubes 9 and 10 are operated by the voltage on the secondary of transformer 2T. The control tubes 9 and 10, therefore, fire only during the on-time when the voltage on the secondary of transformer 2T swings positive (see wave shapes of Fig. 2).

Heat Control Circuit

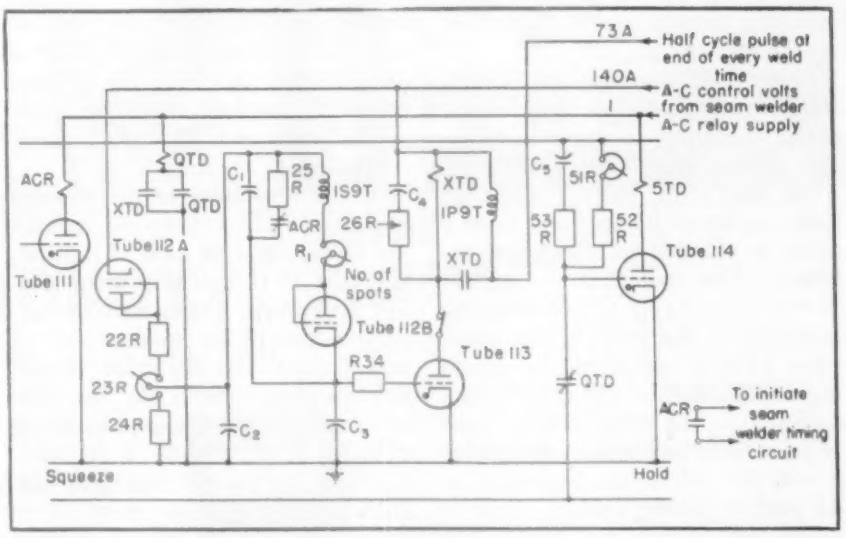
Actually, the secondary windings of transformer 2T are part of a phase-shift network. The primaries of the transformer are located in the variable resistor-capacitor network consisting of 4R, 5R and 5C (Fig. 1). 4R allows a full heat adjustment to the power-factor angle of the load while 5R offers a stepless current adjustment of the welding transformer load of 100 to 20%. Transformer 2T has a secondary with a steep wave front near zero potential, or at the point of critical grid voltage of tubes 9 and 10. These tubes, therefore, are fired by the phase-shifted voltage of transformer 2T, which is controlled by the heat setting of rheostat 5R (see Fig. 1).

Tube 9 fires the leading half cycle and tube 10 fires the trailing half cycle of each weld cycle.

Firing Circuit

As we have seen, tubes 9 and 10 conduct only during the weld time. Let us now add transformer windings in the anode circuits of these tubes.

Looking at the anode of tube 9, one side of primary winding 3T (1) is connected to 140 volts (140A) through resistor 72R. The other side of this winding is connected to 70 volts (70A), which is in phase with 140A. Before the weld is initiated, then transformer 2T impresses a voltage across the primary of transformer 3T (1). The other primary winding of 3T (2) is connected similarly in the anode circuit of



5—CIRCUIT FOR COUNTING SPOTS in multiple-impulse spot welding, using 7-B sequence timer. The desired number of spots is determined by R_1

tube 10 to points 140B and 70B. These voltages appear in the secondaries of transformer 3T located in the grid circuits of firing tubes 11 and 12. The windings are so connected that they give a negative a-c grid bias to the firing tubes when the anode voltages are positive. Grid self-rectification is added by 157C-157R and 167C-167R.

When the weld is initiated, tube 9 will fire at a point determined by the phase setting of transformer 2T. The potential at point 73 will then drop instantaneously from its value of 140A below 70A to ground potential. If we assume for simplicity that tube 9 fires at 90 deg after its anode voltage has gone positive (Fig. 2), then at the desired instant of firing, the polarity of transformer primary 3T(1) is reversed. On the secondary winding, this sudden reversal of polarity makes the grid of tube 11 positive and the tube conducts. Therefore ignitron tube 13 is fired also. By changing the point of firing of tube 9, we can make this "reverse polarity" action fire tube 11 anywhere within the range of phase-shift settings for transformer 2T.

The operation of tube 10 and its reverse-polarity action of secondary winding 3T(2) is similar and causes tube 12 to conduct the trailing half-cycle.

Sequence Timers

Since sequence timers have been described previously (Part I: September Welding Engineer), only special features will be discussed here. Two types of sequence timer initiating circuits are used to initiate the spot welder.

In the 7-B timer, one type of initiating circuit applies a positive d-c potential directly to the grid of the spot welder tube, tube 1 (Fig. 3). Thus, prior to the end of the squeeze time, capacitor 1C in the sequence timer is charged to a positive potential. This potential is applied directly to the grid of tube 1 at the conclusion of the squeeze time when relay 1TD is energized. By applying a phase-shifted voltage (30 deg lagging) to the other control grid of tube 1, we can make certain that it will fire only at the beginning of its positive anode voltage. Tube 1 causes turn-on tube 4 to fire during the next half cycle (Part II: October Welding Engineer). Then if the anode of tube 4 is connected to the grid of tube 1, tube 4 can fire tube 1 again.

Now we have what might be termed a seal-in action. Tube 1 fires tube 4 and tube 4 fires tube 1 continuously during the weld time. When turn-off tube 2 fires (Part II: October Welding Engineer), tube 4 no longer causes tube 1 to conduct since the primary of transformer 4T (1) will no longer act as an inductive load. Tube 1 and tube 4 will stop conducting. Thus capacitor 1C in the sequence timer cannot initiate the spot welder again until after the timer has gone through its entire sequence, and 1C has been recharged.

Transformer 8T, located in the anode circuit of tube 1, also serves the purpose of supplying a feedback voltage to the sequence timer. This feedback voltage, which appears when tube 1 is firing, prevents the hold-time circuit of the sequence timer from operating until the end of the weld time in the spot welder. That is, while feedback voltage is applied to the grid of triode tube 112A in the sequence timer, point 10 is kept negative.

The other type of initiating circuit employs a thyratron tube in the sequence timer to initiate the spot welder (Fig. 4). This thyratron, tube 15, is located in the sequence timer but its anode is connected to the anode of tube 4 in the spot welder. Also in the spot welder, the anode of tube 4 is connected to the grid of tube 1. The control grid of tube 15 is controlled by capacitor 31C, potentiometer 31R and vacuum triode tube 112A. The shield grid of tube 15 receives from 17C-17R a phase-shifted voltage 30 deg lagging, which allows this tube to fire only at the beginning of positive anode voltage.

At the conclusion of the squeeze time, relay 1TD is energized, making the control grid of tube 15 positive, and tube 15 is fired at its next positive half cycle. Because of the inductive load in the anode circuit of tube 4 (and tube 15), tube 15 will fire "initiating-tube" 1. At this time, transformer 8T in the anode circuit of tube 1 will supply a feedback voltage to the grid of the triode tube 112A. This will cause point 10 to become negative and tube 15 to cease conducting.

Tube 1 will fire tube 4. Tube 4 will fire tube 1 again. Thus a seal-in action occurs, which continues until turn-off tube 2 fires.

When the feedback voltage of transformer 8T has stopped, tube 15 will be left with a negative grid potential. This potential will decrease to zero as capacitor 35C discharges through the cool-time potentiometer 31R. At the end of the cool time, tube 15 fires again, initiating the spot weld. The weld and cool times continue until the weld interval is completed. At that time, tube 114 fires and relay 4TD is energized, commencing the hold time.

If the weld interval should time out during a weld time (multiple-impulse welding), relay 4TD may be energized before a weld is completed. This means that the hold-time circuit could begin to time out before the end of this particular weld time were it not for tube 112B. The feedback voltage of transformer 8T applied to the grid of triode tube 112B keeps point 11 negative during the weld. When the feedback voltage ceases, the negative grid potential at point 11 can then discharge through 51R, which determines the hold-time.

This type of initiating circuit is used on sequence timers for multiple-impulse welding and allows as short an adjustment as one-cycle weld, one-cycle cool, if so desired, since no initiating relays are involved.

Counting the Spots

A 7-B timer may be employed to count the number of "on spots" in a seam-welding control (Fig. 5). Here, relay ACR initiates the seam-welding control diagrammed in Part II (October Welding Engineer) at the end of the squeeze time and starts the counting circuit. At the end of every weld, a half-cycle pulse is received from the seam-welding control across the primary of transformer winding 9T. At the end of the desired number of spots, determined by the setting of R_1, capacitor C_1 becomes sufficiently charged to bring the cathode of tube 112B (and the grid of tube 113) to the critical grid voltage of tube 113, which fires. Relay XTD is then energized, ending the seam weld and commencing the hold-time timing circuit.

The End

CASE OF THE WEARING DIPPER TEETH
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1—NEW SECTION was flame-cut to replace faulty section of broken 6 by 6½ in. locomotive frame

2—WELDING VEES. Heavy-coated electrode, of largest permissible diameter, is used for this job

3—COMPLETING WELD on broken 6 by 6½ in. locomotive frame. Frame will be good as new

Repairing Locomotive Frames

Broken frames can be repaired with a minimum of dismantling by arc welding, as described here

BY R. G. SWISHER

THE heavy steel member running from beneath the cylinders to the extreme rear or foot plate of a locomotive varies from 4½ to 7 in. wide and from 5 to 13 in. thick or deep. It would seem that these great steel sections would never fracture nor break. Unfortunately, this is not true, and one of the toughest jobs the railroad weldor can have is a broken locomotive frame.

Cut out Faulty Section

Sometimes the breaks occur in a section previously welded by the bare rod or some other process, and this makes it necessary to remove a large piece of the frame before it can be repaired. The faulty section is cut away with the cutting torch, and a new section is cut to fit. The new piece is then fitted into place (Fig. 1) and clamped securely. Cleaning of the vees is imperative. When all the oxide has been removed by chipping or grinding, the vees are welded with heavy-coated electrodes (Figs. 2 and 3) by one or two operators, and the frame is made as good as new.

When the break is welded by two operators, the root of the weld should be closed as soon as possible and the weld sloped to give a side hill. This will allow the slag to flow to the back of the weld and make it easy to remove. An oscillating bead is faster than single string beads, but the electrode should not be moved more than three times its diameter. For both speed and economy the largest permissible diameter of electrode should be used. It is not uncommon to use 5/16-in. electrodes on a heavy section. Annealing of the weld is not absolutely essential; however, there are stresses locked up in any weld of this type, and heating of the metal to a dull red does relieve the stresses and tends to make a more successful weld.

Eleven years ago, an inspector in a small eastern railroad shop discovered a fracture in the frame of a large Mikado-type engine. This break was underneath a cylinder in a most inaccessible place. The frame in this location was 6½ by 12 in. Since the break was completely covered on the back side by the cast-iron cylinder, it was necessary to vee it entirely from one side. As the break occurred between the saddle bolts, there was no room for expansion and no possible way to reheat without the danger of cracking the cylinder.

As Good as New

This frame required 12 hours of continuous welding with ¼-in. electrodes. Each bead was cleaned thoroughly and peened. After filling the vee, a slight reinforcement was applied. This, too, was cleaned and peened lightly. The locomotive was back in service in a short time, and the weld is still as good today as when it was made. This is a splendid record for a weld of this type.

Not all welds made in this manner are satisfactory but enough of them are so that arc welding is standard practice in most shops. Sometimes a temporary repair of this sort is made to keep a locomotive in service for a short period. Later, the engine is brought into the shop and the doubtful section is removed. A complete new section is then welded into place in order to assure a successful job.

Photos courtesy The Hobart Brothers Co.

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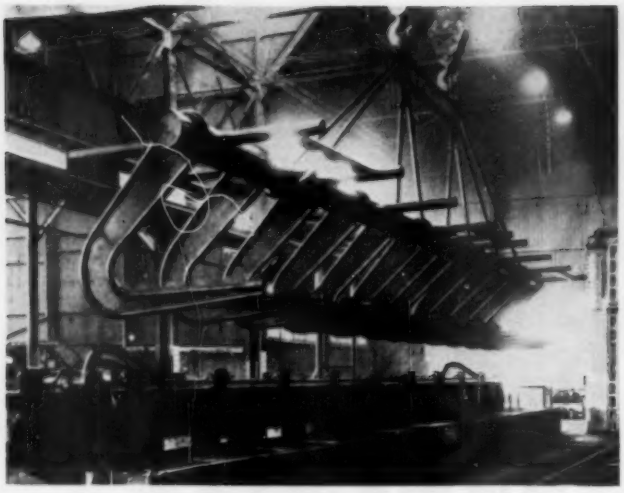
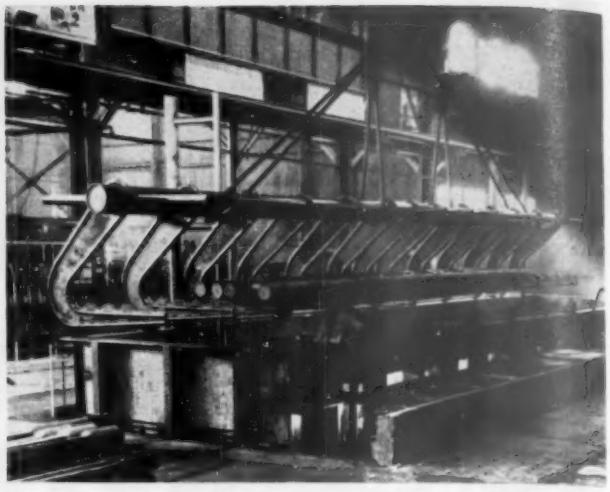


1—LIFTING RIG ready to pick up batch of five bars



2—BARS ON HOOKS after removal from quench tank

Handling Hot Steel Bars

Engineers of Spang-Chalfant have developed a clever welded rig for handling long bars of alloy steel after heat treatment at high temperatures

BY L. E. TRISHMAN

Chief Research Engineer, Spang-Chalfant Div., National Supply Co.

THE problem confronting engineers of the Spang-Chalfant Div. of The National Supply Co., Ambridge, Pa., was how to handle long bars of alloy steel for heat treatment. The requirements were to keep the bars straight for oil quenching after they had been heated to the austenitizing temperature. Bars at such temperatures cannot be handled with ordinary crane slings without serious sagging and bending.

Can Pick up Five Bars

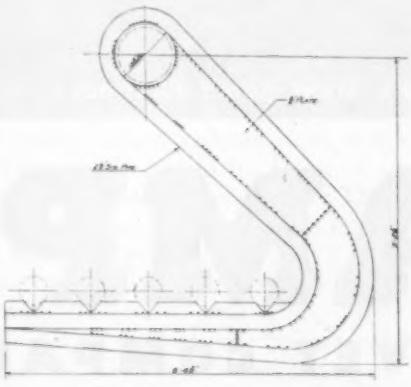
A lifting rig was developed that is able to handle bars in lengths ranging from 30 to 50 ft and in diameters of from 4 to 8 in. In Fig. 1, this rig is being lowered by crane to pick up a batch of five heated bars from the furnace car bottom. Fig. 2 shows the bars on the hooks just after removal from the quench tank; it can readily be seen that they have kept their straightness.

As Spang-Chalfant is a manufacturer of seamless pipe mills, the most readily available material for construction of the lifting rig was pipe. Pipe, because of its advantageous cross-section for light weight and stiffness, makes excellent beams and structural members when a welded design is used. The main member of the rig is made up of two lengths of casing, of 13 3/8-in. diam by 0.380-in. wall thickness, welded together through a 2-ft-long sleeve at the center. The large-diameter pipe used for the main support provides torsional rigidity so that the individual hooks will remain in line.

Weld in Cross Pieces

The welded halves of casing make a central support 54 ft long for the hooks. The cross pieces welded through this main member are castings of 5-in. diameter by 0.500 wall thickness. These cross pieces act as guides and stops when the hooks are being slid under the heated bars on the furnace car bottom and also when the rig is lowered into the quench tank. The supporting "rods" and also the stiffeners around the 3/4-in. web plates of the hooks are 2½-in. standard pipe. All exposed ends of pipe are closed by welding discs over the ends to prevent the entrance of quenching oil.

The eyes which receive the crane hooks are flame-cut from 1½-in. plate and welded to the ends of two 12-in. by 20.7-lb channels placed back to back. The supporting rods are welded to these plates by heavy continuous fillet welds. All welds on the supports and main member are continuous arc welds.



3—HOOKS are built as shown here

Construction of Hooks

The welding construction of the 13 hooks is shown in the diagram, Fig. 3. Both sides of each hook are welded as shown to the 3/4-in. webbing plates and to the "V" plates which keep the bars properly spaced for quenching. Even though its overall dimensions are 54 ft long, 9 ft 7 in. wide and 14 ft 3 in. high, the assembly weighs only a little over five tons, yet it will support five bars and keep them satisfactorily straight during quenching.

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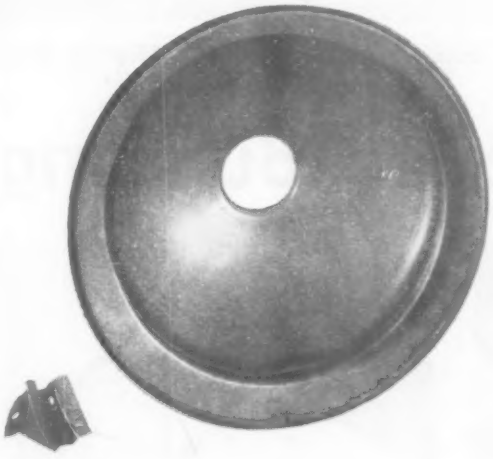

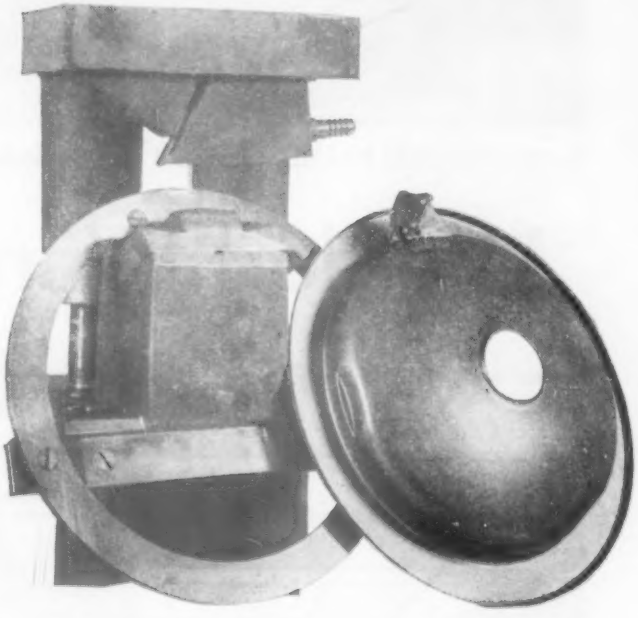

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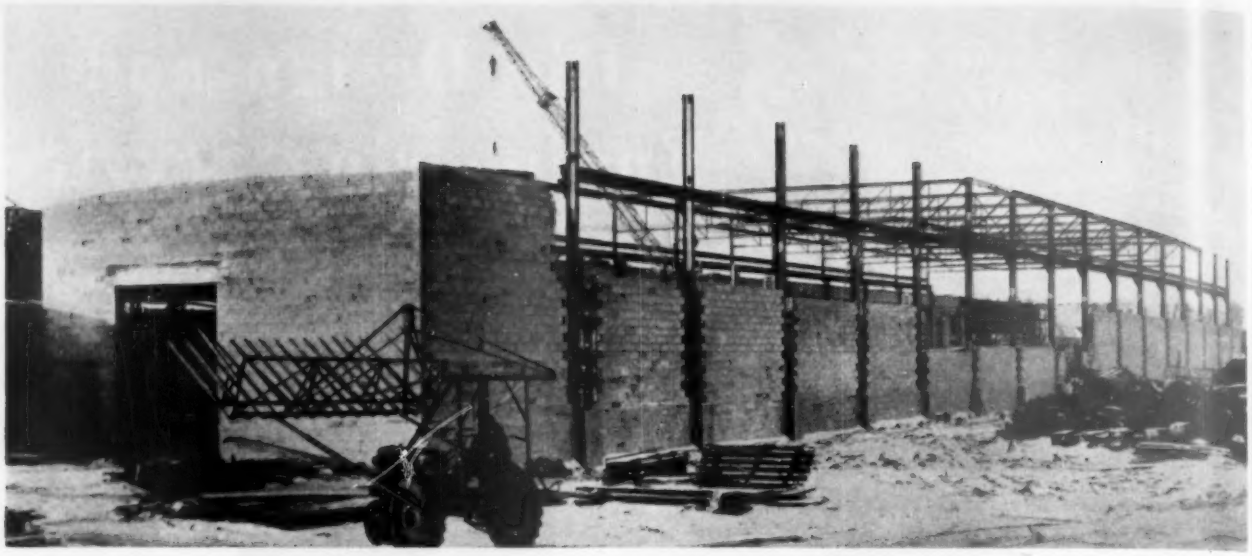
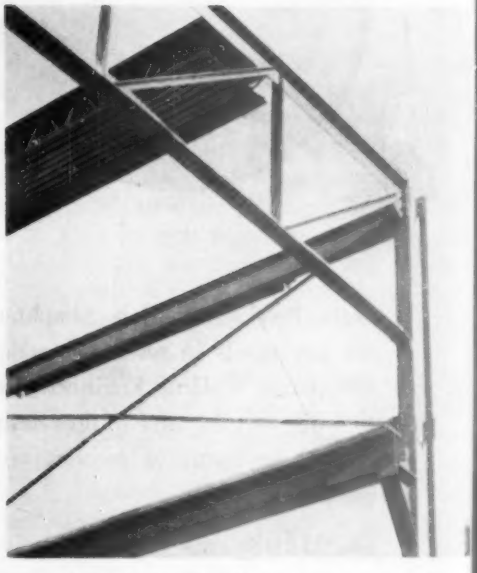


1—ALL-WELDED FRAME with bolted field connections is chief feature of this warehouse at Hopkins, Minnesota

Welded Warehouse Building

2—TRUSS CONSTRUCTION. Note how the section changes on the lower chords of the trusses. Each 60-ft truss was prefabricated



3—DETAIL of column and connecting crane runway. The columns are 29 ft high

A NEW $20,000 warehouse addition to the plant of the Superior Separator Co., Hopkins, Minn., is of all-welded steel-frame construction. Trusses and columns were prefabricated by the Crown Iron Works Co., Minneapolis, and bolted together in the field. This building, an original design, is said to effect an estimated saving of 20% over comparable conventional steelwork.

The welded building (see Fig. 1) is 342 feet long. The columns are 29 ft, trusses 60 ft and bays 20 ft center to center. Steel used is structural grade SAE 1020.

Fabrication of the trusses utilized fillet welding on the web members. On the chord section where the section changes (see lower chords of trusses in Fig. 2), 60-deg vee grooves with ⅛-in. root openings were employed. All of the shop welding was done in the flat position, utilizing horses to hold the beams.

Fillet welding in fabrication was done with ¼-in. E-6013 electrodes and butt welding with E-6010. All butt welds used in fabrication were made in five passes: one starting bead, three finish beads and one final bead. A current of 160 amp was employed with the 5/32-in. E-6010 electrodes and 300 amp with the ¼-in. E-6013 class. All butt joints were welded with 100% fusion.

Additional details of the structure can be seen in Fig. 3, which shows a column with connecting crane runway truss.

Photos courtesy The Lincoln Electric Co.

Standards for Synchronous Precision Timers

(Courtesy National Electrical Manufacturers Association)

IC19-44 Synchronous Precision Timers—Range of Timing Adjustment

Standard synchronous timers shall be capable of performing their stated functions from the lower to the upper limits, inclusive, shown in the following table:

RANGE OF TIMING ADJUSTMENT

Functions	60-Cycle Power Supply	50-Cycle Power Supply	25-Cycle Power Supply
Weld Time	1-30 cycles	1-30 cycles	1-13 cycles
Heat Time	1-30 cycles	1-30 cycles	1-13 cycles
Cool Time	1-30 cycles	1-30 cycles	1-13 cycles
	Number of Heat Times		
	1-15	1-15	1-15

Recommended Standard 3-7-1946.

IC19-46 Synchronous Precision Timers—Steps of Timing Adjustment

The standard synchronous precision timers shall be provided with steps of 1 cycle throughout the standard time range.

Recommended Standard 3-7-1946.

IC19-48 Synchronous Precision Timers—Timing Accuracy

Synchronous precision timers shall provide synchronous timing and shall conform to the following standards with respect to repetitive and calibration accuracy.

The accuracy of a synchronous precision timer, when operating on a circuit where the control circuit voltage at any time does not vary more than ±10 per cent from the value for which timer is adjusted, shall be such that the variations from the calibrated values shall not exceed those listed in the following table:

	Allowable Variation from Time Setting for Heat Time, Weld Time and Cool Time					
	60-Cycle Power Supply		50-Cycle Power Supply		25-Cycle Power Supply	
	Range of Time Setting—Cycles	Allowable Variation—Cycles	Range of Time Setting—Cycles	Allowable Variation—Cycles	Range of Time Setting—Cycles	Allowable Variation—Cycles
	1-15	0	1-15	0	1-13	0
	16-30	±1	16-30	±1		
	Allowable Variation from Setting					
Number of Heat Times	1-15	0	1-15	0	1-15	0

Recommended Standard 3-7-1946.

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The high welding currents, characteristic of the process, produce uniform welds of extremely deep penetration at high speeds. In welding alloy steels and non-ferrous metals, special welding rod and sometimes special types of the granular welding material are used to produce weld metal of the composition and characteristics required.

LINDE Engineering Service can help you whether your job involves UNIONMELT welding or any other of the numerous LINDE methods for joining, cutting, forming or treating metals.

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"Give us the tools..."

TO SURVIVE

America Must Have Better Tools

IN THE past twenty years the United States has failed to provide its workers with enough new tools and equipment.

To most Americans this statement will come as a shock—or will be doubted. We are quite complacent about our industrial equipment, for easily understood reasons.

Throughout the '30s we heard continuously the propaganda line that the United States had become a "mature economy." The job of equipping America with industrial plants and tools was said to be largely done.

Now, knowing that industry is spending billions to expand and rebuild its plants, many people assume that the result must be a first-class industrial system.

A further powerful inducement to complacency is the vastly *worse* industrial condition of most of the rest of the world. When Americans look abroad in almost any direction they see shattered plants and equipment. A natural reaction is that we are sitting pretty.

That is a dangerous reaction. Between depression and war, we have failed to build the tools and equipment we need. This condition is dangerous for three reasons:

1. *From bitter experience we know that national security depends first and foremost on the capacity and readiness of our industrial equipment.*

All of our plans for stabilizing prosperity assume a world at peace. The greatest menace to peace would be an unarmed America, unable or unwilling to keep herself strong and ready for defense—strong in spirit, in resources and in the all-important industrial plant and equipment.

2. *Whether Americans live well—or badly—depends directly on the kind and quality of tools used by American workmen.*

This is true for all workers, and for every worker—from a garage mechanic and his wrenches to a steel mill gang and its rolling equipment. In a monumental study of "America's Needs and Resources" the Twentieth Century Fund found this fact: The improvement in the real income of the American people has more consistently followed the amount of power used in industry than anything else. What the workman worked *with* determined, more than any other factor, the size of his pay envelope, and what it would buy.

3. *Our success in stabilizing prosperity will depend largely on what we do about building new tools and equipment.*

About 30% of our industrial workers are employed in producing tools and equipment. Steady employment for them is essential to our over-all prosperity.

How far have we fallen behind in providing new plants and equipment?

Estimates vary. Here is one rough estimate: If we had built new industrial facilities during 1930-48 at the rate we did in the prosperous '20s, we would have spent at least $100 billion more than actually we did.

To get a better and more complete measure of this deficit, McGraw-Hill is undertaking a survey of American Business' Needs for New Plant and Equipment.

Businessmen all over the nation are being asked to answer questions like this: How much

money would you need to put your plant in first class condition? How much are you planning to spend for new plant and equipment? Where do you expect to raise the money? The results will be reported later in this editorial series. Already the survey shows we have fallen many billions of dollars behind.

Some shortcomings are apparent to everyone. They are revealed in a lot of rickety transportation facilities and in rundown buildings.

Many other deficiencies do not come into general view. They are, for example, the antiquated machines in our plants. Of the privately-owned machine tools in use in 1945—when the last census of metalworking equipment was made by AMERICAN MACHINIST—54% were more than 10 years old. Their average age is higher today.

It is true that in recent years we have hit new highs in total national production. But we have done so by putting far more people to work than ever worked before . . . and by driving equipment to the limit of its waning endurance, sometimes beyond. It has not been done *primarily* in what is by all odds the best way to increase production—to use more and better and more modern tools and equipment.

Haven't we overcome much of this twenty-year deficit by rushing to build new plants since the end of the war?

No. For two clear-cut reasons:

1. The accumulated shortage is tremendous. The total of about $40 billion, which has been spent for industrial plant and equipment since VJ-Day, has not wiped it out.

2. Some key industries have had difficulty in getting the facilities they need. Take steel, for example—the industry that turns out our most basic industrial material. Its needs for new equipment are measured in billions of dollars. To pay for that equipment, it should have *risk capital*—money which people are willing to invest with a risk of losing for the sake of gain. For steel is an up-and-down industry. Earnings on its common stocks inevitably share both ways in those ups-and-downs.

Since the war, steel, in common with most of industry, has been unable to market new common stock successfully. Its outstanding stock is now selling for only about one-half the current net worth of the industry's present assets. With investors willing to pay only 50 cents on the dollar for its facilities, the industry can not readily sell stock to pay for *new* plant and equipment—at higher prices even than the old.

Why can't steel—and other industries—attract people who are willing to risk their money retooling America?

The full answer to that serious question must be left to future editorials in this series, for it involves many things . . . tax reform . . . mobilization of small savings . . . a new respect for corporate profits.

This first editorial seeks simply to emphasize two fundamentals:

First, our standard of living improves with the *quality* of our industrial equipment.

Second, American industry and American workmen badly need billions of dollars worth of better equipment *now*.

The American people must understand that *not only our continued prosperity but also our security as a nation depends upon giving American industry more and better equipment.*

"Give us the tools." This was Winston Churchill's cry for help to win the war. Only if we give American industry new and better tools will we have a chance to win abiding prosperity at home and good order abroad.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

★ THIS EDITORIAL, and a series to follow, will be devoted to a single problem—how to provide American industry with the equipment needed to improve that envy of the world, the American standard of living. No more important problem confronts us today. Upon our wisdom in handling it depends not only the degree of our prosperity, but also our security as a nation.

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One of the best ways to obtain consistently high quality in welding is to establish regular inspection with proved testing procedures. Radiography *is* a proved testing procedure, serving to control welding quality by providing objective information. This helps the operator maintain a high standard of workmanship...keeps plant and customer informed on the quality of every job.

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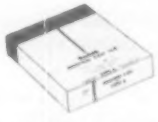

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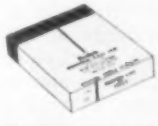

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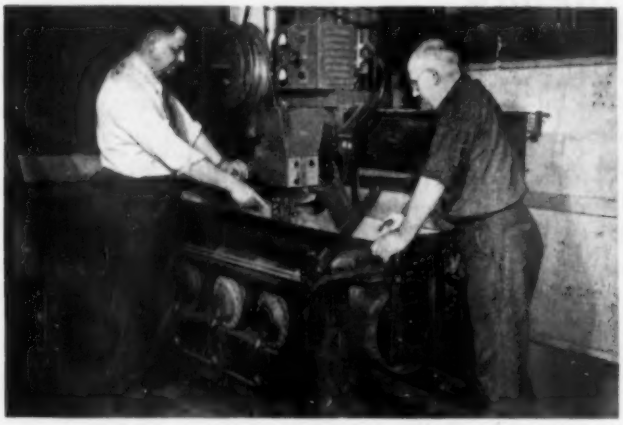
Courtesy The Linde Air Products Co.

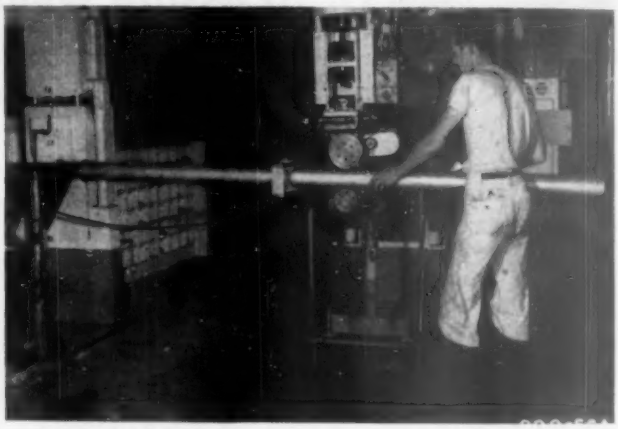
SUBMERGED-MELT WELDING built up bore of two-ton forge hammer ram, enabling it to be returned to service after a few days

Courtesy Air Reduction Sales Co.

FLAME-CUTTING 15-IN.-WALLED cast-iron ingot mold to charging box size. Only 96 minutes were needed to cut 12 ft



INVENTORS J. R. Geddes (left) and Frank Bumgarner (right) with the fixture they devised to hold electric water heater tanks



SPRING ON ARM pulls short copper mandrel through tube after 18 in. have been welded and as soon as roller pressure is released

Jig for Heater Tanks

FINDING nothing on the market to hold water heater tanks for automatic welding of the longitudinal seams, J. R. Geddes and Frank Bumgarner, plant superintendent and maintenance engineer respectively for the Fowler Mfg. Co., Portland, Ore., made their own device. As shown in the accompanying picture, air cylinders at the side grip the tank while a beamlike structure inside it exerts pressure upward to hold the edges together. A welding head of the conventional hidden-arc type works along the seam automatically.

* * *

Cutting up 48-Ton Mold

A LABOR which would have stumped Hercules was asked recently of a Pacific Northwest iron works. This task was the reduction to charging box size of a 48-ton ingot mold with walls 15 in. thick. To further complicate the problem, the location of the cast-iron mold required that it be halved where it lay.

Though it wasn't the usual way of doing it, the iron works engineers decided on machine flame-cutting with a heavy-duty water-cooled torch. Using a 2½-in. square billet as a waster, the machine carriage was started at a speed of 1½ ipm. Fire clay was packed on both sides of the billet to keep the molten steel in the kerf.

The oxyacetylene flame slashed through the 15-in. walls of the casting and the 2½-in. waster like a hot knife through butter. Only 96 minutes were needed to make the 12-foot-long cut.

* * *

Tapered Bore Rebuilt

TAPERED bore of a 4,000-lb forge hammer ram was built up in 8 hours of submerged-melt welding. The bore is 14 in. long and tapers in diameter from 6 to 5 in. Thirty pounds of metal were deposited, reducing the diameter of the bore by ½ in.

The two-ton ram was first machined to remove impregnated copper from previous shimming. It was then wedged and tack welded into slots cut in two circular pieces of plate (upper left illustration.) These circles were placed on four dead rollers for ease in positioning.

The welding head was provided with a 24-in. extension and mounted on a carriage. Height was then adjusted so that the nozzle could enter the bore. The composition of the steel made it necessary to preheat the ram to 600 F. The weld deposits were laid in a longitudinal direction, and the ram was turned one-half turn for each bead.

* * *

Movable Mandrel

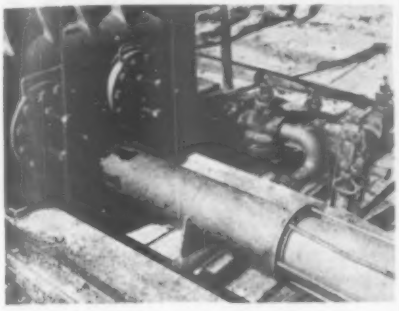
IN SEAM welding a tube on a standard seam welder it is necessary to insert a copper mandrel to support the inside of the tube and complete the welding circuit. A mandrel the full length of a long tube might be too unwieldy to handle. By using a short copper mandrel attached to a spring-loaded arm, North American Aviation, Inc., Los Angeles, found that even a long tube could be

successfully seam welded. It works in the following manner:

After a distance of 18 in. has been welded, roller pressure is released, allowing the spring to pull the mandrel along the unwelded portion of the tube. Another 18 in. is welded, and the process is repeated until the entire seam has been finished.

Employee Thomas Kent suggested this time-saving method, which increased production 400% and released a helper for other duties.

* * *



TRANSVERSE 3-in. pipe was made to serve as support for the 10-in. suction line

Pump Casting Protected

BY ELTON STERRETT

THE 10-in. suction line from a skid-mounted pump extended for nearly five feet before being equipped with a flexible union to absorb pump vibration. Weight of the long unsupported pipe placed undue stress on the flange at the main pump casting. Result was that the bolts would work loose, sometimes seriously damaging the expensive casting.

To eliminate this difficulty, the weldor took advantage of the 3-in. pump-priming line traversing the webs of the two skid beams. He cut from heavy tank steel a saddle which would fit under the 10-in. pipe and rest securely on the extra-heavy 3-in. transverse line. The saddle was welded across the entire line of contact with both pipes, and the 3-in. pipe was welded to the skids by heavy beads on both sides of the web. The suction pipe was thus "unitized" with the skid, and the flange joint relieved of all stresses except those imposed by the pumping of fluid within it.

* * *

Copper Storage Tanks

BY USING the inert-gas-shielded welding process to fabricate silicon-copper alloy tanks for the storage of chemicals, the Consolidated Steel Corporation of Texas reduced clean-up operations to a minimum. The argon gas shielding the electrode and weld area eliminated the need for flux; there was no corrosive residue and the smooth neat welds required no grinding.

The tanks are 8 ft in diameter by 18 ft in overall length. Each has a 3-ft steel skirt. The shell was formed from ⅜-in. plate, and the head from ¼-in. plate.

Van Dorn 1/4" HOLGUN*
$38.00
Other Drills from 1/4" to 1 1/4" capacity in steel

Watch a Van Dorn Drill on the job and you'll marvel at its speedy drilling, easy handling, trouble-free running! Check its engineering and you'll find a powerful Van Dorn-built motor, ball-bearing mounted; extra-tough gears, shaft and chuck spindle; husky housing; quality-built construction right down the line!

Take the Famous Van Dorn HOLGUN, for example. For easier handling, its smooth housings with "Pistol Grip and Trigger Switch" fit naturally into any hand, right or left. Its light weight and compactness reduce operator fatigue. Its short working clearance and spindle offset of only ¾" help you drill in tight spots. So, when it's Drills you need, see your nearby Van Dorn Distributor—for capacities from 1/4" to 1 1/4" in steel, double in hardwood—standard and heavy-duty models—high or low speeds—with a universal reputation for long life. Write for free catalog to: The Van Dorn Electric Tool Co., 734 Joppa Road, Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

FOR POWER SPECIFY

"Van Dorn"

(DIV. OF BLACK & DECKER MFG. CO.)

PORTABLE ELECTRIC TOOLS

Electric Sanders | Bench Grinders | Sheet Metal Shears | Electric Hammers | Portable Grinders

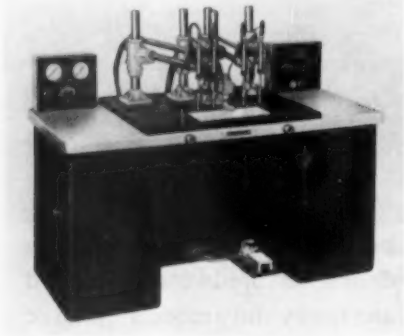
New Products to Use

QUICK-DISCONNECT is feature of hose coupler with ball-bearing swivel action

Hose Coupler

SNAP-TITE, INC. has produced a quick-disconnect hose coupler approved by Underwriter's Laboratories, Inc. For use with either oxygen or acetylene hoses, the coupler has built-in valves that shut off the gas the instant the hose is disconnected. The ballbearing swivel action prevents kinking, and leakage is claimed to be impossible. SNAP-TITE, INC., Erie, Pa.

* * *



FUSING of tip studs provides arc path for capacitor discharge in new stud welder

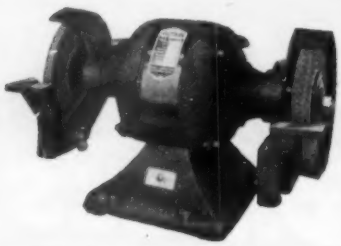
Stud Welder

CAPACITOR-operated, a new self-timed stud welder uses tip studs which fuse when they come in contact with the work to provide a path for the discharge current of the capacitor to form an arc. Arc melts both the diameter of the stud end and workpiece directly under it and is followed by a hammer blow to weld the pieces. Time of arc is about a thousandth of a second, making possible the use of high currents.

Some advantages claimed for the short arc time are: concentration of heat, welding of studs on thin metal, no fillets, no distortion of work and no discernible heat. Studs, it is said, can be welded on the back of plated or painted surfaces without marring them. No flux is necessary.

Studs are now available in diameters up to ½ in. Welder operates on a three-phase a-c, 110/220/440 volts. Welding pressure may be mechanical or pneumatic. Overall dimensions of cabinet are 30 by 66 in. GRAHAM MFG. CORP., 1643 National Bank Bldg., Detroit 26.

* * *



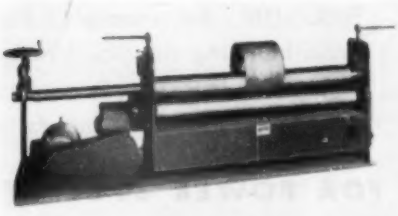
LIGHT GRINDING, sharpening, buffing performed by new ¼-hp bench grinder

Bench Grinder

STANLEY ELECTRIC TOOLS, New Britain, Conn., has introduced its No. 266 bench grinder. Powered by a ¼-hp constant-speed induction motor, this grinder is useful for light grinding, sharpening tools, buffing, polishing and wire brushing.

Featured are enclosed ball bearings, safety wide-wheel guards, adjustable tool rests and toggle switch enclosed in a molded case located in the base of the grinder. Guards are adjustable to permit grinding at any point on the circumference of the wheel. Speed at 60 cycles is 3,450 rpm. Furnished with two wheels, 6 by 2 in.; one coarse and one fine.

* * *



HIGH CLEARANCE featured on top rolls of new pyramid-type bending rolls

Bending Rolls

PYRAMID-TYPE bending roll series 650 has been placed on the market by REED ENGINEERING CO., Carthage, Mo. These machines are all steel and feature high roll clearance between the top and lower rolls to permit the rolling of heavy bars and light structural shapes as well as plates. Two lower rolls are also spaced closely together to minimize the "flat" normally found on sheets or plates rolled in machines of this type.

Top roll on all sizes is 7½ in. diameter and the two lower rolls are 6½ in. diameter. Capacities of various models range from 4 ft by 1/16 in. sheet to 8 ft by ¼ in. sheet.

* * *

NON-TOXIC dusts filtered from air by new lightweight protective face mask

Protective Masks

THROAT, nose and bronchial tubes can be protected from large particles of non-toxic dusts by a new ½-oz face mask consisting of a plastic shield and replaceable laminated filler held in position by an adjustable elastic headband. These featherweight masks are recommended for brazing shops, foundries, cement plants, machine shops and factories except when toxic dusts are present.

Refill filters are packed twenty-five to a package. GENERAL SCIENTIFIC EQUIPMENT CO., 2700 West Huntingdon St., Philadelphia 32.

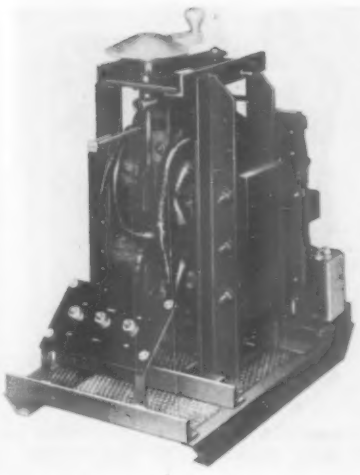
* * *

SMALL-DIAMETER electrodes for cutting stainless, cast iron, bronze, aluminum, etc.

Metal-Cutting Electrode

SMALL-diameter electrodes (3/32 in.) for cutting stainless, bronze, nickel and copper are now available for use with small a-c welding machines.

Called "Cuttrode," these electrodes are also available in size 3/16 in. for chamfering and cutting heavy cast iron; in ¼ in. for heavy parts. EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York 13.



FOUR-COIL transformer is exclusive feature of "Sureweld" welders. Twelve industrial and shop models are available

A-C Welder

"SUREWELD" a-c welder, in shop and factory models, has been announced by the NATIONAL CYLINDER GAS Co., 840 North Michigan Ave., Chicago 11. The new welder is made in twelve models, seven for high-speed, heavy duty fabrication, and five for duty in garages, repair shops, etc.

Two exclusive features are included in these welders: four-coil transformer with movable magnetic shunt, and correct ratio of open circuit to arc voltage. On both model types, high-potential secondary circuits offer ample dielectric strength, tested to withstand 7,000 volts.

Four-coil transformer controls flux-diversion in such a way that output current is varied as required, without altering secondary voltage, reactance or other characteristics.

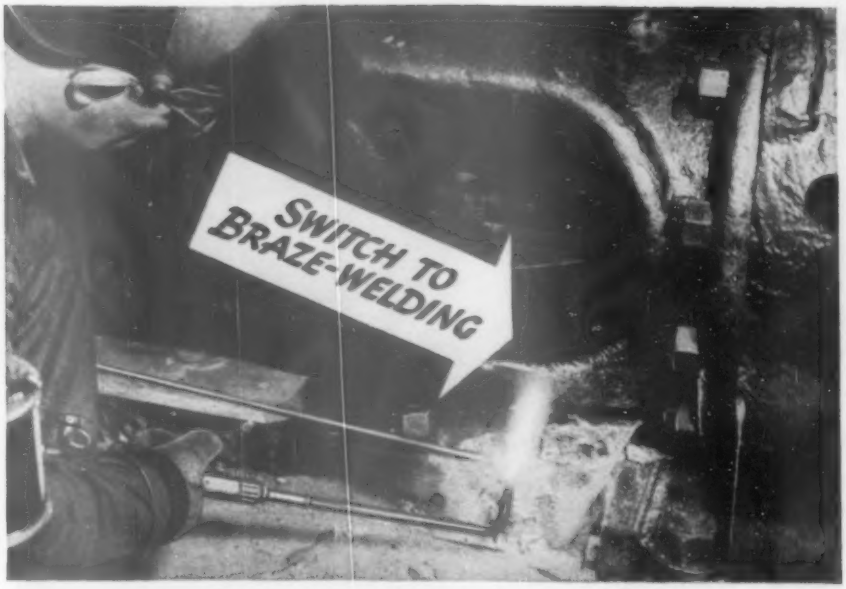
Optional controls are available, such as an on-and-off power control—primary contactor and a choice of three switches—where frequent power shutoffs are desirable. Amperage remote control is also available. Shop units have large rubber-tired wheels and towing tongue for portability.

* * *

Multiple Spot Welder

LATEST model Rex "Multi-welder" is said to be capable of 7,000 welds per minute and has a range of from 18 to 12 gauge wires. It is equipped with fifty-six 10-kva, 440-v, water-cooled transformers. Each has an individual heat-control switch with three tap settings. The heat is also controlled by three Westinghouse synchronous panels which include phase-shift heat control.

Overall dimensions of the machine are 15 by 19 ft. Floor space required would be 15 by 20 ft including spacing between the machine and the baler. It can be operated by one man with a reel man to handle the feed. Control is centered in a single push-button panel where the operator has full view of the welding operations. REX WELDER AND ENGINEERING Co., 1910 Walnut St., Kansas City, Mo.



SAVE TIME AND LABOR
WITH BRIDGEPORT No. 192 LOW FUMING BRONZE ROD

The economy of brazing is well demonstrated by the repair of the broken bedplate of the pump illustrated. It was unnecessary to dismantle the equipment, thus saving both time and labor. Quick repairs with Bridgeport's No. 192 Low Fuming Bronze Rod put this pump back in productive service in short order.

In other respects, too, braze-welding is easier and more economical. Since No. 192 Low Fuming Bronze forms a strong bond after only local preheating of the parent metal to a cherry red, the delay and expense of extensive preheating, slow cooling and stress-relieving are eliminated. The low fuming characteristics permit working in greater comfort.

No. 192 Low Fuming Bronze Rod flows freely, has good tinning action, forms tough, strong joints that are often stronger than the parent metal. For further information on Bridgeport's many welding alloys, write today for your copy of "Bronze Welding Alloys".

"Bridgeport" BRIDGEPORT BRASS COMPANY
BRIDGEPORT 2, CONN. • Established 1865
Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

WELDING ALLOYS AVAILABLE

BRIDGEPORT No. 192
BRONZE—LOW FUMING
General purpose alloy. Ideal for repairing heavy-duty equipment as well as small parts—building up wearing surfaces—joining parts in industrial and construction work.

NAVAL BRASS
Fuses readily at 1625° F. Recommended for uniting cast iron and steel parts—building up wearing surfaces—joining parts in industrial and construction work.

BRAZING ROD
Satisfactory for conditions that are not subject to great wear or heavy shock loads.

BRIDGEPORT MANGANESE
BRONZE (NAVY)
Recommended for strength and toughness in repairing cast iron and steel castings—building up worn surfaces—joining parts in industrial and construction work.

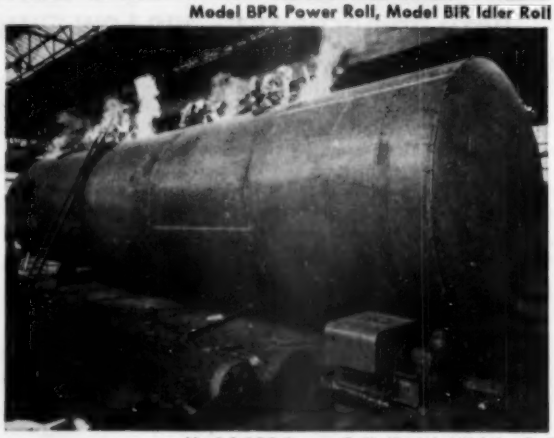
BRIDGEPORT No. 632 and No. 609
SILICON BRONZES
Both are used for oxyacetylene, carbon arc, or metallic arc welding methods for making silicon bronze storage tanks, automatic heaters, corrosion-resisting ducts, structural sections, vats, etc. No. 632 contains more silicon, is slightly stronger and has a little lower melting point than No. 609.

Bronze Welding Rod A PRODUCT OF
BRIDGEPORT BRASS

No Need Now for Welders to be Acrobats

Model BPR Power Roll, Model BIR Idler Roll

MORE PRODUCTION AND BETTER WELDS WITH



Model APR Power Roll, Model AIR Idler Roll

Ransome TURNING ROLLS

Welders can make all welds "down hand" with heavier electrodes when Ransome Turning Rolls bring the work into convenient working position for *increased production* and *neater, better welds.*

The improved Ransome line includes three models, with standard capacities from 3 to 45 tons, up to 14 feet in diameter, stationary or self-propelled. (Rolls for heavier or larger work also available.)

Ransome features for trouble-free operation: *unobstructed loading* from either end, due to lowered drive mechanism • *easy rotation* under heavy load, due to anti-friction self-aligning bearings (Models B, C) • *strength where most needed*—exclusive combination bronze and steel reinforced worm wheel • *quick adjustment* for varying diameters • *adjustable variable speed rotation.*

Send coupon for bulletin.

INDUSTRIAL DIVISION

Ransome MACHINERY COMPANY

DUNELLEN, NEW JERSEY

A SUBSIDIARY OF WORTHINGTON PUMP AND MACHINERY CORPORATION

50% PRODUCTION UP LABOR COSTS DOWN

TURNING ROLLS

WELDING POSITIONERS

Ransome Machinery Company
Dunellen, N. J.

Please send Bulletin 228-1 on Ransome Turning Rolls.

Name .....

Company .....

Address .....

YB-7

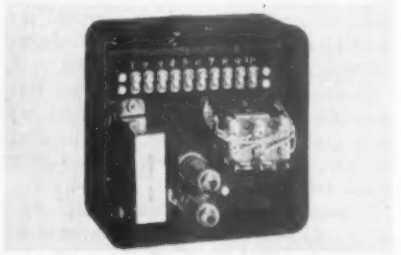
AIR-OPERATED projection welder has horn attachments for spot welding

Projection Welder

ACME ELECTRIC WELDER Co., 2618 Fruitland St., Los Angeles, announces a projection welder designed for light work. Designated as Type PT-O, this welder is an air-operated, press-type welder supplied in capacities of 20, 30 and 40 kva. Horn adapters and horns are available to convert it from projection to spot welding.

Solenoid-operated air valve is furnished with either single-stage or two-stage foot switch. Standard throat length is 6 in.; when converted to a spot welder, throat length is increased by 6 in.

* * *



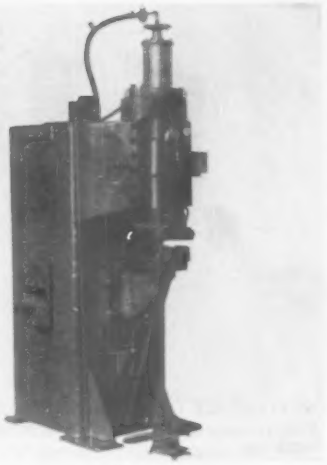
"ROBOTECTOR" for resistance welders protects transformer from condensation, saves water flow

R-W Water Control

DESIGNED to protect a welding transformer from condensation is the "Robotector," an electronic timer for a 1½-minute interval. It also saves on water flow and reduces sweating, rust, corrosion and mineral deposits.

Timer is initiated through a relay contact or switch located in the customer's weld timer. When welding sequence is started, the "Robotector" is energized. This closes the electrical circuit to the water valve solenoid, allowing water to start flowing. At the same time, the circuit is completed to the heating elements in the flow switch and the ignitor circuit is closed so that the ignitron contactor may be initiated.

As long as the welding sequence is repeated within the interval of 1½ minutes, all of the above circuits remain closed. If the stop-period is longer, all the circuits open and water stops flowing. ROBOTRON CORP., 56 Manchester, Detroit 3.



COFFEE POT lips are welded at a rate of 4,000 per day with projection welder

Projection Welder

WELDING of kitchen utensils is being done four times as fast as before with a new projection welder developed by THE FEDERAL MACHINE AND WELDER Co., Warren, O. The first model built, employing simplified dies, is being used to weld lips to coffee pots at a rate of 4,000 per eight-hour day. Only one cycle of current is needed to complete the weld. The high current capacity necessary for welding light materials of large areas at short intervals of time is obtained with a 175-kva water-cooled welding transformer.

A low-inertia spring head, incorporating a slide within a slide and leaf springs, gives a quick follow-up. Standard T-slot platens permit quick change of dies.

* * *

Soldering Stick

FULL-STRENGTH soldering flux in stick form is made without the addition of any binder or cementing agent. It is, therefore 100% flux and much more active. This soldering stick is useful in sheet metal and electrical work. It is convenient to handle and carry in a tool kit.

No wax, grease, or other hard-to-remove residue will be left on the joint, manufacturer states. AMERICAN SOLDER AND FLUX Co., 2152 E. Norris St., Philadelphia 25.

* * *

Rod for Tight Joints

A SMALL welding rod for tight steel joints is being produced by EUTECTIC WELDING ALLOYS CORP., 40 Worth St., New York City 13. Its diameter is 1/32 in. Called "Eutecrod" 16, it is designed for use with "Eutector" flux No. 16.

The new rod may be used in ring form, preplaced and heated either by torch or induction heating. It is expected to find application in aircraft plants, tool and die shops, sheet metal industries, etc., in spots where larger diameter welding rods have proved unsatisfactory for tight fits.

HIGH PRESSURE CYLINDER VALVES

for OXYGEN and HYDROGEN

Designed, tested and proved for high pressures and severe service.

Packing may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

for ACETYLENE

Listed by Underwriters' Laboratories.

Cadmium-plated steel stem with monel tip resists rust and wear.

Ball-nose seat construction assures positive shut-off.

for CARBON DIOXIDE

Available with diaphragm-type or packed-type construction.

Compact, rugged design for use with high pressures.

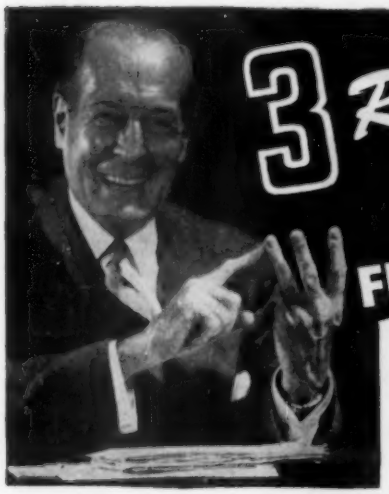
Equipped with bursting disc safety device.

*Reg. U.S. Pat. Office

REGO

The BASTIAN-BLESSING Company
4201 Peterson Ave. · Chicago 30, Ill.

Pioneer and Leader in the Design and Manufacture of Precision Equipment for Using and Controlling High Pressure Gases



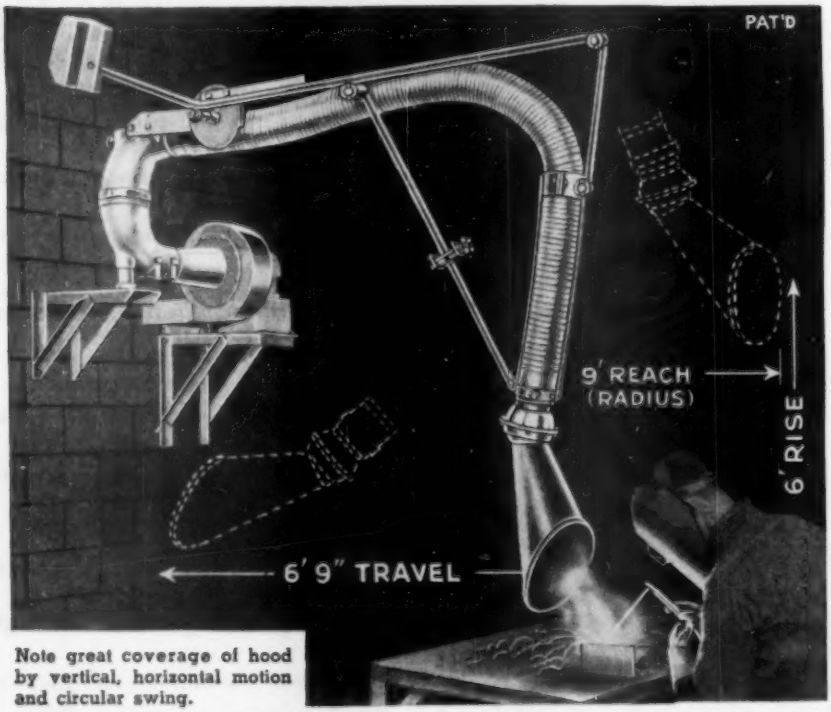
3 Reasons Why We Chose a RUEMELIN FUME COLLECTOR

There are three very good reasons why we decided to install a RUEMELIN FUME COLLECTOR in our shop, after we saw it in operation. Like all of our equipment this measures up to the highest standards of dependable performance and maximum health protection because it is:

1. MORE EFFECTIVE — The powerful suction of the RUEMELIN FUME COLLECTOR efficiently draws out noxious gas, smoke and heat at the source. It provides great coverage, minimizes building heat loss, reduces welder's fatigue and guards employee's health — all to increase shop efficiency and output.

2. COMPLETELY FLEXIBLE — It is easily installed with least expense. When in operation, its hood instantly and conveniently adjusts for greater proximity to welding area without tedious adjusting devices.

3. UNIVERSALLY APPROVED — The RUEMELIN FUME COLLECTOR has the approval of state industrial commissions and compensation insurance companies. In addition it has the support of the thousands of users who have found their Ruemelin installations so satisfactory on the job.



Note great coverage of hood by vertical, horizontal motion and circular swing.

Standard Model D-5310 with hood reaching out 9 feet from wall. Also available in Long Reach Model D-5342 with hood reaching out 15 feet from wall.

For complete details write for Bulletin 37-C

RUEMELIN MFG. CO.

MANUFACTURERS AND ENGINEERS
SAND BLAST AND DUST COLLECTING EQUIPMENT
3880 NORTH PALMER STREET • MILWAUKEE 12, WISCONSIN, U. S. A.

A 5490-8/8

AUTO-RESET saves effort on new timers. Time ranges from 5 seconds to 5 minutes

Industrial Timer

INSTANT automatic reset is featured on a new series of timers. As soon as the clutch is disengaged, an internal spiral spring brings the actuating arm back to its reset position.

Adjustment is made by moving the black button pointer to the time cycle required. These series PAC timers have various ranges: the smallest from 5 cycles to 5 seconds, calibrated in 5 cycle steps, and the largest, from 2 minutes to 3 hours in 2 minute steps. They are synchronous motor-driven. INDUSTRIAL TIMER CORP., 115 Edison Place, Newark, N. J.

* * *

Low-Hydrogen Electrodes

FOUR new electrodes designed as types W-60, W-61, W-62 and W-95 have been announced by GENERAL ELECTRIC'S WELDING EQUIPMENT DIVISIONS, Schenectady 5, N. Y. Three are low-hydrogen electrodes and one is for hard-facing.

Type W-60, designed to meet the need for an electrode with a low-hydrogen coating and manganese-moly analysis is suitable for welding most hardenable steels where underbead cracking is likely. The range of weldable materials includes low-alloy, high-sulphur, high-carbon, high-manganese and similar steels.

Type W-61, a low-hydrogen electrode of a moly-vanadium composition, can be used with either a-c or reverse polarity d-c to weld a wide variety of low-alloy steels. It is suited for welding low-alloy pipe, including carbon moly, and chrome-stabilized carbon moly and new varieties of alloy considered as "high tensile".

Type W-62 is a low-hydrogen, titania-coated electrode of 2½% nickel composition which can be used on steel castings of a similar analysis. It produces weld deposits having high impact properties at subzero temperatures.

Type W-95 hard-facing electrode is designed to deposit hard wear-resisting weld metal in all positions. It is suitable for surfacing dipper teeth, dragline bucket lifts, tractor cleats, roller crusher teeth, mud pumps, impeller crane hooks, sand pumps and sizing screens.

SMALL POSITIONERS, hydraulic or mechanically operated, handle work on 360-deg horizontal plane. 150 lb capacity

Work Positioners

IMPROVED small work-positioners, one mechanically operated for light work and another hydraulically operated for heavy-duty jobs, are called "Powrarms." They position work at any angle on a 360-deg horizontal plane or on a 180-deg vertical plane.

These tools combine the ball-and-socket joint principle with a positive locking device. Work up to 150 lb in weight can be handled on the hydraulic model. Either type may be bolted to a work bench, or clamped with a special clamp to other locations in field or shop. WILTON TOOL MFG. CO., 936 Wrightwood Ave., Chicago 14.

* * *

Hard-Facing Electrodes

TWO NEW tubular type shielded-arc electrodes, "Faceweld No. 1" and "Faceweld No. 12," have been added to the Lincoln hard-facing line. "Faceweld No. 1" deposits a chromium-carbide type alloy surface and is used for hard-facing parts of plain carbon, low alloy or manganese steel. It is designed to resist abrasion and moderate impact. Single layer deposits have a hardness of 40 to 52 Rockwell C and multiple layer beads 52 to 60 Rockwell C.

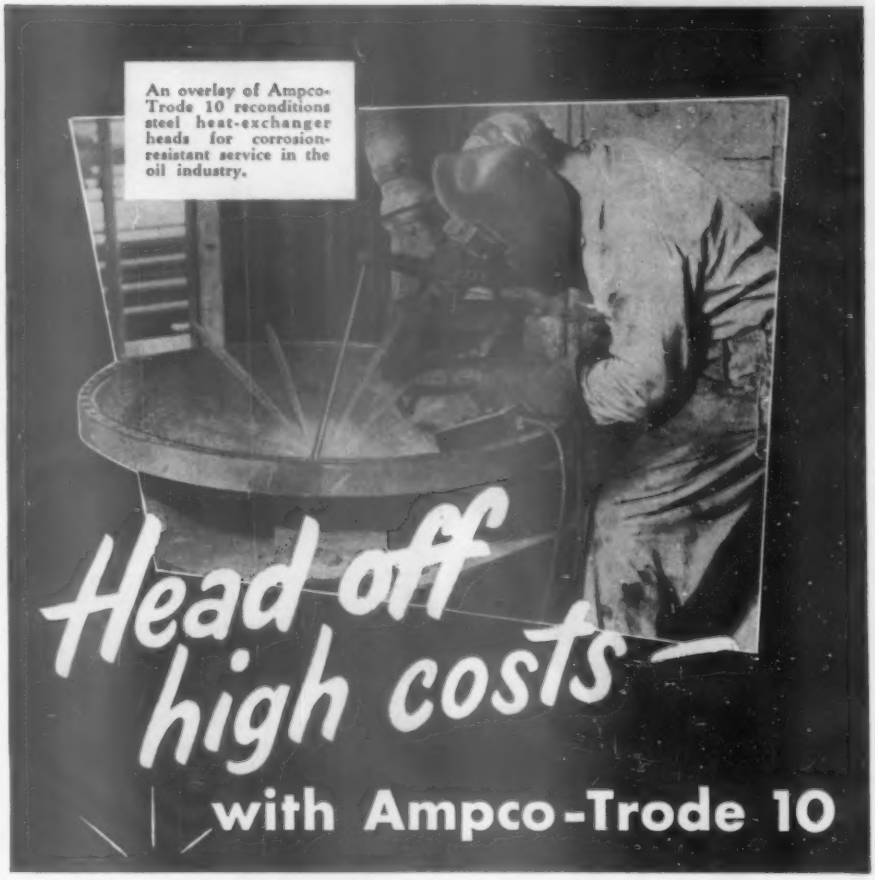
No. 12 is an electrode designed for use where the hard-faced surface must withstand very severe abrasion as well as some impact. Single-layer deposits have a hardness of 45 to 55 Rockwell C; multiple layers 55 to 65 Rockwell C.

Both rods operate with either a-c or d-c and are available in 14-in. lengths, 5/16 and 3/16 in. diam. LINCOLN ELECTRIC CO., 12818 Coit Rd., Cleveland 1.

* * *

Bronze Die Alloy

ALUMINUM-BRONZE alloy for use in forming and drawing dies has been developed by Ampco Metal, Inc. Known as grade 24, the new alloy is said to couple hardness properties with high compressive strength and wear resistance. Increases of two to five times in die life before redressing have been recorded. AMPCO METAL, INC., Milwaukee 4.


An overlay of Ampco-Trode 10 reconditions steel heat-exchanger heads for corrosion-resistant service in the oil industry.
Head off high costs —
with Ampco-Trode 10

—avoid frequent replacements by using durable corrosion-and erosion-resistant overlays

Ampco-Trode 10 aluminum bronze arc welding electrodes save money for users every day — making parts last longer, increasing productive time, cutting maintenance costs.

Reconditioning steel heat-exchanger heads in the oil industry is a typical case. Subject to erosion and corrosion, these heads are quickly impaired in service. To avoid expensive replacement, they are reconditioned with Ampco-Trode 10, an aluminum bronze welding electrode. 1/4" electrodes are used, deposited with a fast wide-weave bead to minimize base-metal pick-up. No finish grinding is required. The superior corrosion-resistant qualities of this aluminum-bronze overlay actually make the head "better than new."

You, too, can save time and money with Ampco-Trode 10! Use it to weld dissimilar metals—for bearing surfaces where hardness and friction resistance are important—for process equipment where corrosion-resistance is essential. See your nearest Ampco distributor today for a supply of these money-saving electrodes. Write for bulletins giving complete information.

Ampco Metal, Inc.

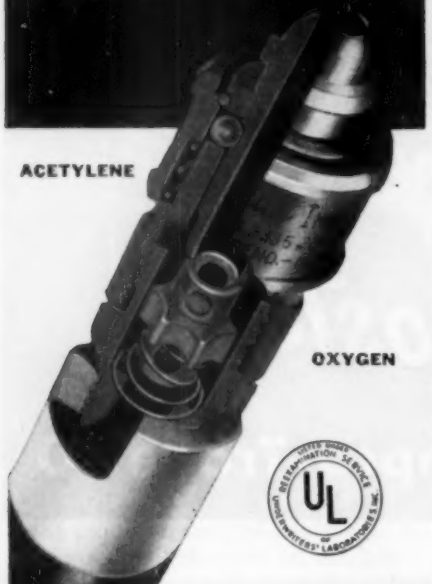
Department WE-11, Milwaukee 4, Wisconsin

Field Offices in Principal Cities

INTRODUCING . . .

*Snap-tite

THE WELDING HOSE COUPLER THAT'S UNDERWRITER APPROVED



Proudly we announce the industry's first Underwriter approved quick disconnect Coupler. Changing torches is no longer an annoying, time-consuming job. Now it can be done speedily, efficiently and in absolute safety. With Snap-Tite equipment, torches snap on or snap off. Just like that. And no shut off at the tank is required, either. Built-in valves close automatically when torch is disconnected. And Underwriter approved Snap-Tite is inexpensive, too.

GET THE FULL STORY NOW. Ask your distributor for a demonstration . . . or write the factory.

What zippers are to clothes . . . SNAP-TITE S are to hose

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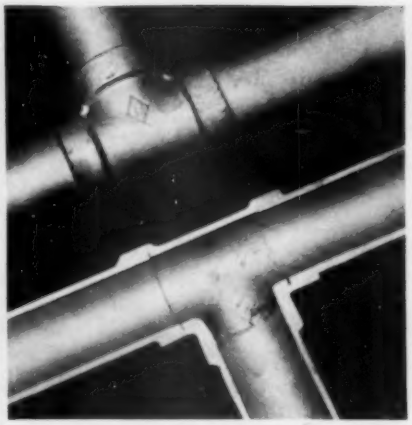
*Snap-tite

ERIE, PENNSYLVANIA



THREADLESS bronze fittings useful for one-piece brass and copper radiant heating, fuel oil, steam, gas, etc.

Bronze Pipe Fittings

FLAGG-FLOW threadless fittings in bronze are now available to fabricators of non-ferrous piping to supplement previously announced socket-type fittings of black malleable iron (see page 45, April, WELDING ENGINEER). Any capillary-action-alloy can be used to attach the new bronze fittings by brazing. They are said to be applicable for 150 psi working steam pressure lines at 450 deg F, or 300 psi non-shock cold water, oil or gas lines and can be used with thin-wall brass or copper tubing. FLAGG Co., 1421 Chestnut St., Philadelphia 2.

* * *

Contact Welding Electrodes

LIME ferritic, iron oxide and organic type "contact welding" electrodes with a special coating are being offered by NORTH AMERICAN PHILIPS CO., INC., 100 East 42nd St., New York 17. Designated as "Norelco," these electrodes may be used in all positions except upward vertical. They are said to have automatic starting and re-igniting properties and from 25 to 100% higher rate of deposition than standard types. They may be used with standard a-c or d-c welding equipment, reverse or straight polarity and high currents up to 600 amp for the 5/16-in. size.

* * *

Tinning Pencil

RUSTPROOFING metal, regalvanizing spots, tinning bearings, etc., is said to be done quickly with the new "Kromover" touch-up pencil. Oil-impregnated bronzes, burned cast iron, stainless steels and black iron may be tinned, it is claimed. Only preparation necessary is wiping off of oil and dirt with a clean rag.

In operation, the pencil, which is 3/4 in. square and 4 in. long, is placed on the metal to be treated. Metal is then heated by a torch to about 450 deg F when pencil melts and coats the surface. Oxyacetylene, air-acetylene, or city gas may be used for heating. ALL-STATE WELDING ALLOYS CO., 96 West Post Rd., White Plains, N. Y.

Tempilstik°

the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

- WELDING
- FLAME-CUTTING
- TEMPERING
- FORGING
- CASTING
- MOLDING
- DRAWING
- STRAIGHTENING
- HEAT-TREATING IN GENERAL

It's this simple: Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

Also available in pellet or liquid form

Available in these temperatures (°F)

125	275	500	1100
138	288	550	1150
150	300	600	1200
163	313	650	1250
175	325	700	1300
188	338	750	1350
200	350	800	1400
213	363	850	1450
225	375	900	1500
238	388	950	1550
250	400	1000	1600
263	450	1050	

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

We invite inquiries from reputable distributors interested in handling Tempil° Products.

TEMPIL° CORPORATION

134 West 22nd St., N. Y. 11, N. Y.

Welding Lens

AMERICAN AGILE CORP., 5806 Hough Ave., Cleveland 3, announces improved "Agile Metalklad" welding lenses. These lenses are claimed to have high light reflectivity and absorption qualities that reduce arc glare. Welding efficiency is said to increase from 15 to 20% and visibility 42%.

Alloy metal is used for the coating in a new process. The basic dark welding lens is clad on the outside surface to make it reflect the ultraviolet and infrared rays given off by the arc.

* * *

Silicon-Bronze Electrode

COPPER and silicon-bronze base metal may be welded with new silicon-bronze electrodes, which can also be used to join galvanized iron and silicon-bronze to steel. Applications are expected in the manufacture of chemical and food-processing equipment, sewer disposal equipment and hot water tanks. Electrode is available in five diameters from 3/32 to 1/4 in. and in lengths varying from 11 to 18 in. AIR REDUCTION SALES CO., 60 East 42nd St., New York 17.

* * *

Hard-Facing Electrodes

ENGINEERED for heavy equipment protection, two new hard-facing alloys are announced by STOODY CO., Whittier, Calif. "Self-Hardening 21" is for applications involving extreme abrasion with moderate impact, and Stoody 1027 is for severe impact with moderate abrasion. They are recommended for application on tractor parts, power shovels, crushers, etc.

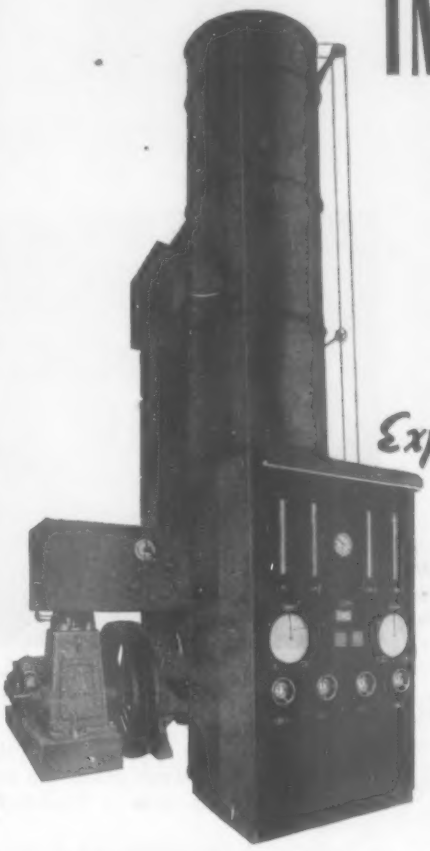
"Self-Hardening 21" electrode is of fabricated tubular construction and includes chromium, manganese, silicon, carbon and zirconium in its composition. For downhand application, its deposit hardness is 55 Rockwell C. It is available in 1/8 and 3/32 in. coated, 3/16 and 1/4 in. bare and coated, 3/8 in. bare electrodes.

"Stoody 1027" has a mild-steel core wire and an extruded graphite-type coating. An all-position electrode, its hardness is 45 Rockwell C. Available only in coated form in 1/8, 5/32, 3/16 and 1/4 in. diameters.

* * *

Nickel Electrode

"HOBART NICKELCAST" is a 100% nickel electrode for producing machinable welds on cast iron without preheating the metal. Welds are claimed to be machinable both in the deposit and line of fusion and may be drilled, tapped or machined at any point in the weld zone. Nickelcast is said to be free from fluorides and not to produce injurious gases. Coating is insulated to prevent arcing in confined quarters. Electrodes may be used with either a-c or d-c equipment and are available in 3/32, 1/8, 5/32 and 3/16 in. diameters. HOBART BROTHERS CO., Troy, O.



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Producing Plants

Built in standard sizes as listed below in single and double rectification units. Streamlined panel provides quick visibility of all gauges. Compact design—requires minimum of floor space.

SIZES IN METERS AND CUBIC FEET

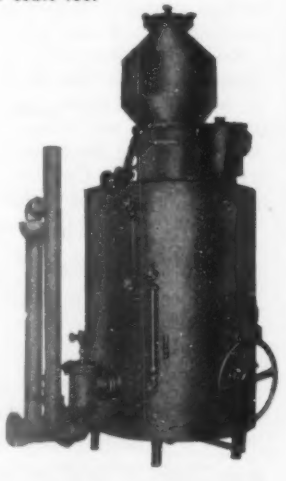
15 Meters or 530 cubic feet	75 Meters or 2650 cubic feet
30 Meters or 1060 cubic feet	100 Meters or 3530 cubic feet
40 Meters or 1412 cubic feet	150 Meters or 5300 cubic feet
55 Meters or 1940 cubic feet	200 Meters or 7060 cubic feet

Larger sizes also available

LOW PRESSURE

ACETYLENE GAS

PRODUCING PLANTS



This 600-lb. Acetylene generating Plant is one of the safest plants manufactured. Automatic controls minimize the operating personnel. Capacity 2700 cu. ft. per hour. Generator only is illustrated. Affiliate units are designed to insure maximum production at minimum costs. Complete details of construction and plant layout on request.

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CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN

O'FALLON, ILLINOIS

News of the Industry

X-Ray Laboratory Dedicated at Milwaukee by Celebrities

WORLD'S largest X-ray development laboratory was dedicated by the General Electric X-Ray Corp. at Milwaukee on Sept. 13. Named the Coolidge Laboratory, it is a permanent living tribute to Dr. William D. Coolidge, 75-year-old X-ray pioneer and director emeritus of the G-E Research Laboratory, Schenectady, N. Y.

Company employees and visiting radiologists, physicists, military experts and research scientists were all present at the dedication ceremonies. A special train was provided to bring to Milwaukee some 200 radiologists attending the annual convention of the American Roentgen Ray Society in Chicago.

The new laboratory, opened to public inspection immediately after the dedication, contains a high-voltage section isolated from the rest of the building by a concrete wall 3 ft thick and 25 ft high. There are also a complete pilot plant for building X-ray tubes and high-voltage rectifying tubes; a chemical and metallurgical area for work on tungsten, beryllium, glass and other materials; and a photo-technical department for testing radiographic and fluoroscopic devices.

Dr. Coolidge's development of ductile tungsten led to the tungsten target for X-ray tubes, which made possible the present-day reliable X-ray tube. His multisection "cascade" principle of introducing voltage in stages made possible the modern million and two million volt tubes.

Known as "the father of the modern X-ray tube," he has been honored by 13 medals and seven honorary degrees from scientific and educational organizations, including an honorary M. D. degree from the University of Zurich, Switzerland. He also holds 83 patents.

In 1941, Dr. Coolidge was named to a six-man committee which evaluated the feasibility of atomic-bomb production and recommended that such a project be carried out.

DR. W. D. COOLIDGE holds a multisection million-volt X-ray tube. His inventions and research made it possible

Speakers at the ceremonies included Dr. Arthur C. Christie, director of the Department of Radiology at Doctor's Hospital; Dr. Coolidge; J. H. Clough, president of General Electric X-Ray Corp.; M. J. Gross, vice-president in charge of engineering; W. D. Crelley, now marketing manager of Telechron, Inc., a G-E affiliate; and Charles E. Wilson, president of General Electric Co. Mr. Wilson addressed nearly 500 guests at a dinner held at the Schroeder Hotel following the afternoon ceremonies.

Extensive research programs carried on by large companies probably no longer pay for themselves on a dollar-and-cents basis, asserted President Wilson in his evening address. Nevertheless, research touches upon the national security and economic stability of our whole country and must be carried on—as is being done by private industry.

Fansteel Acquires Vascoloy-Ramet

ENTIRE common stock equity in Vascoloy-Ramet Corp., formerly held by Vanadium-Alloys Steel Co., was acquired recently by Fansteel Metallurgical Corp., North Chicago, Ill. Two thirds of the company was formerly owned by Fansteel.

Vascoloy-Ramet manufactures and distributes tantalum and/or tungsten carbide cutting tools, dies and parts. Its plant at Waukegan, Ill., will carry on an expansion and integration program as the Vascoloy-Ramet Division of Fansteel.

* * *

Lincoln Foundation Makes Structural Textbook Award

TRUSTEES of the James F. Lincoln Arc Welding Foundation have announced a joint award of $5,000 to Professor C. D. Williams of the University of Florida, Gainesville, Fla., and Professor E. C. Harris of Fenn College, Cleveland, O., co-authors of a textbook manuscript entitled "Structural Design in Metals."

Irwin-Farnham Publishing Co., Chicago, will publish the textbook, one in a series of the Textbook Award Program established by The Lincoln Foundation.

* * *

Permanente to Lease Ohio Rod and Bar Mill

PERMANENTE METALS CORP., Oakland, Calif., has completed preliminary negotiations to lease an aluminum rod and bar mill in Newark, O., from the War Assets Administration. Contract provides for a 10-year lease with option to renew for another 15 years.

The $23,000,000 plant has an annual capacity of 180,000,000 lb of rod, bar and structural shapes.

* * *

Stress Analysis Society To Hold Annual Meeting

ANNUAL meeting of the Society for Experimental Stress Analysis will be held at the Hotel Commodore in New York City on Dec. 2, 3 and 4. For further information, address the secretary of the society in care of P. O. Box 168, Cambridge 39, Mass.

WELDING OXYGEN and acetylene producing facilities at Edmonton, Alberta, recently constructed by Canadian Liquid Air Co., Ltd. Costing more than $250,000, this new plant is located at 8615 Stadium Road. It is the company's fourteenth gas producing plant. Complete stock of welding equipment for shops, garages and factories is carried. Nearest gas supply had been at Calgary

SEVEN-STORY building purchased by National Cylinder Gas Co., Chicago.

National Cylinder Gas Occupies New Building

NEW executive headquarters of the National Cylinder Gas Co., have been established in a recently purchased seven-story building at 840 North Michigan Ave., Chicago.

Building houses, in addition to executive offices, all administrative departments, including legal, personnel, credit, engineering, advertising, accounting and purchasing. New quarters is the center of a sales system with offices in 55 cities. Alterations now in progress will provide a year-round air conditioning system, modern lighting and acoustical ceilings.

Chicago district sales office will remain at its present address of 4700 West 19th St.

• • •

Supersonic and X-Ray Tests Combine Advantages

COMBINING of supersonic testing with radiographic methods produces reliable inspection of welds on pressure containers, according to Herbert R. Isenburger, St. John X-Ray Laboratory, Califon, N. J.

Tests were carried out on 16 pressure vessels made of low-carbon steel. Each vessel was 9 ft long and had an OD of 7½ ft and a wall thickness of ¼ in. Some 650 feet of butt-welded longitudinal and girth seams were inspected.

First, all welds were tested with the supersonic "Reflectoscope," and the results marked on the blueprints for each container. Most defective portions of the welds as shown by this method, about 10% of the total, were singled out for a recheck by X-rays.

Of the rechecked defective welds, 20% showed a continuous lack of fusion throughout the length of the X-ray film (10 in.) whereas supersonic inspection had indicated the longest continuous defect to be only 3 in. On the other hand, says Mr. Isenburger, 10% of the rechecked portions where supersonic inspection had indicated serious defects showed only minor ones in the radiographs.

The remedy, Mr. Isenburger suggests, is to check any large irregularity showing on the "Reflectoscope" screen by a radiographic exposure. Economy and speed of the supersonic method is then backed up by the X-ray process to locate and chart all defects.

4 reasons why TITAN Bronze Welding Rods are First choice

1 Careful alloying, plus thorough deoxidation, results in strong, ductile welds.

2 Close metallurgical control assures constant uniformity of product.

3 Seven types of rods provide for all applications. You can choose the rod exactly suited to your needs.

4 Large warehouse stocks permit us to fill your order promptly. TITAN Bronze Welding Rods are available in the quantities you need *when* you need them.

TITAN Bronze Welding Rods are concisely described in our 5-page folder. Useful suggestions for making better welds have also been included. Write for your free copy today.

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Here's practical, fine quality protection at a price you can afford.

Molded from one piece of sturdy fibre. No rivets to loosen, tear or burn out. Shock proof and light proof. Deep molded for positive protection. Well ventilated, comfortable and easily sterilized. Convenient, quick adjusting headgear.

Model 1250 shown here, is available with quick-change metal coverplate, lense holder.

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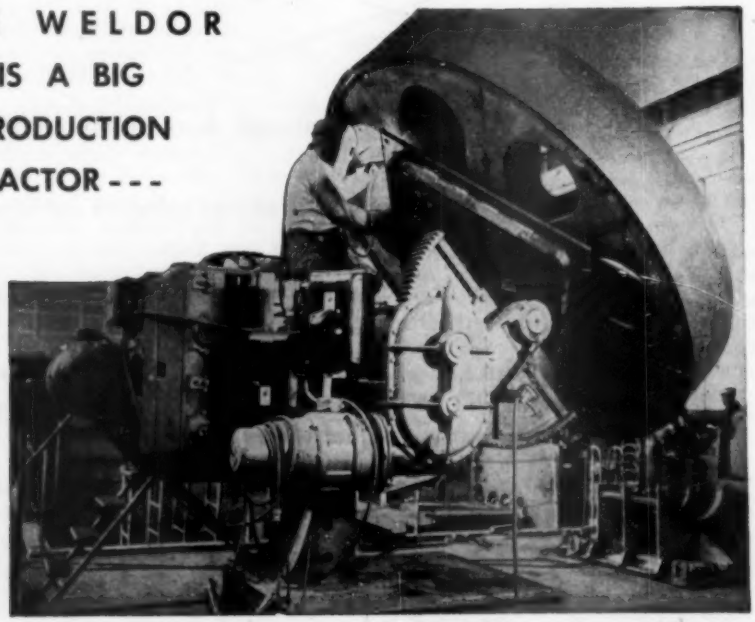
THE WELDOR IS A BIG PRODUCTION FACTOR - - -



Your weldors are big production factors when they work with C-F Welding Positioners because these power operated Positioners with variable speed table rotation are real production tools. Better automatic welding is possible because the C-F Variable Speed feature governs table rotation speed from 0 r.p.m. and up—assuring better control of fillet in circular or peripheral automatic welding.

If increased production, better downhand welding and lower costs in your welding department can help you meet the competition for new markets, C-F hand and/or power operating welding positioners should be your first choice. Write for Bulletin WP 24.

CULLEN-FRIESTEDT CO.

1309 S. KILBOURN AVENUE CHICAGO 23, ILL.

Cold-Welding Tests Conducted in England

COLD-WELDING techniques carried out in research laboratories of the General Electric Co., Ltd., in England, were described in a recent issue of the British magazine, *The Engineer*. Cold welding is a method of making lap welds by mechanical pressure alone at ordinary room temperature.

For satisfactory results, the metal surfaces in contact must be completely clean and the pressure must be applied over a narrow strip in such a way that the metal can flow away from the weld at both sides.

Pressure to unite the lapped specimens is applied with tool dies in a press. The tools produce corresponding indentations in specimens. Three types of welds have so far been tested: straight, ring and seam (long straight welds). Tools used have been of mild steel or chrome-manganese steel. Properly designed weld joints have about the same ultimate strength as the parent metal.

—*McGraw-Hill World News*

* * *

Smallest Sheet Mill Planned for Seattle

CONSTRUCTION of what is said to be the smallest sheet steel mill in the United States is planned by the Seidelhuber Iron & Bronze Works as an experimental project according to Frank Seidelhuber, Jr., company official.

The small mill, estimated to cost $200,000 will have one electric furnace with a capacity of five to eight tons. Daily production of 30 to 50 tons is expected with a heat every three hours. The three-high roll will be able to produce sheets from 10 to 30 ft long and 14 in. wide, in thicknesses ranging from ¼ in. to 18 gauge.

Planning of the mill was given impetus by the new steel rates under which Seattle pays $9 or $10 a ton more for sheet steel than do California users. Mr. Seidelhuber plans to use most of the steel he produces in his own business of fabricating water tanks, but will probably sell to other consumers also.

* * *

Welded Marine Pipe Rules Published by Welding Society

NEW edition of the "Rules for Welding Piping in Marine Construction" has been published by the American Welding Society. Purpose of the rules is to effect a uniformity in the classification and basic welding requirements for piping of the governing agencies in the shipbuilding industry. Two important points have been revised and clarified in the new issue: materials and classification of piping.

Copies of the marine pipe rules can be obtained from the American Welding Society, 33 West 39th St., New York 18, N. Y. at twenty-five cents each.

Detroit to Confer on Electric Welding

DETROIT will play host to a conference on arc and resistance welding scheduled for Dec. 6, 7 and 8 under sponsorship of the American Institute of Electrical Engineers' Electric Welding Committee, the Michigan Section of AIEE, the Detroit section of the American Welding Society and the Industrial Electrical Engineers' Society of Detroit.

Meetings will be held at the Horace B. Rackham Memorial Building, 100 Farnsworth Ave. Accommodations will be available at the Detroit Leland Hotel for those who register early.

An inspection trip through an auto plant will be a feature of the program. Other events will be an evening session, open free to the public, devoted to maintenance and maintenance training; high-speed movies of the welding arc; papers on recent observations of the arc and electrode burn-off rates. A session devoted to inert-arc welding will cover such subjects as the effect of inert atmospheres on weldability and the FCC radio interference rulings.

Resistance-welding topics will cover the relative merits of three-phase versus single-phase welding, effect of various wave shapes, plant distribution systems and utility power supply problems.

Informal discussions will be led by the authors of papers presented, both with audience participation and as "round-table" discussion among the experts. Wire recordings will be made of papers, round-table proceedings and discussions for later publication in book form.

Information and registration forms are now available from L. E. Donelson, c/o Michigan Bell Telephone Co., 1365 Cass Ave., Detroit 26.

* * *

Ohio Welding Firm Builds New Shop

ROBERT L. HAHN of the Bedford Welding Co., Bedford, O., has started construction of a new welding and machine shop which will double the company's present floor space. Present plant is also occupied by Billco Machine Products Co., operated by William Hahn.

* * *

Arizona Welding Firm Plans New Construction

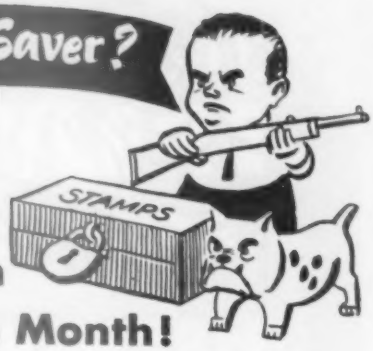
ARIZONA WELDING EQUIPMENT Co., Phoenix, Ariz., is building a $50,000 plant with 9,600 sq ft of floor space, more than three times the firm's present area. Completion date is scheduled for January.

* * *

Iron Pipe Manufacturer To Build California Plant

U. S. PIPE & FOUNDRY Co. has purchased a 35-acre tract to build a manufacturing plant in Richmond, Calif. This firm manufactures cast-iron pipe by the centrifugal process.

Are You A Postage Saver?



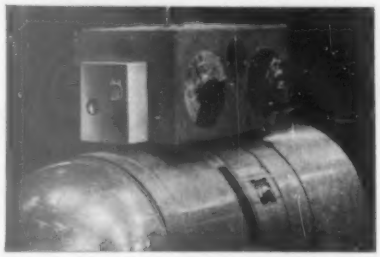
One Idle-Running Welder Can Cost You More Than 250 3¢ Stamps Each Month!

IT'S A FACT... The cost of the power *wasted* by one idle-running 300 or 400 ampere d.c. welder would pay for 250 three-cent stamps each month! Tests show that welders *run idle 50 to 95% of the time!*

Power is not the only item you waste. Your welder's service life is slipping away, too — all the time it's running. Idling motors drag down your power factor, disturb power loading. It all adds to your operating cost — needlessly.

Needlessly, because now there's a reliable means of *automatically* starting your welder when it's needed and stopping it when welding ceases. The answer is the DV Automatic Start-Stop Welder Control. Job-tested DV controls start the welder the moment the electrode contacts the work piece, and automatically shut down the welder 1 or 2 minutes after welding stops. The time delay (adjustable) keeps the set running while the operator changes electrodes, positions his work, etc.

The average number of starts with DV controls is but 15 per 8-hour shift, yet the savings in reduced idle time have—on hundreds of installations—paid the entire cost of DV controls in less than a year!



An accurate arc time totalizer (optional) records actual welding time in minutes. Production and cost data can easily be obtained without the bother of measuring weld footage or weighing rod.

DV controls are easily installed on any electric-driven d.c. welder equipped with magnetic starter. They do not interfere with the regular welder controls, nor with the operator's usual welding technique.

Longer Service Life with less maintenance results when idle running time is reduced; that's why International Sales Company equipped their machines with DV Controls.

Improved Power Factor was another advantage gained when this modern plant installed DV Controls on all welders (idle-running welders have very low power factor). Photo taken at the San Francisco plant of Gar Wood Industries, Inc.

START SAVING NOW... Write or wire us today for literature and prices...

D-V WELDING CONTROLS

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High Strength

Machinable Welds

In Cast Iron . . .

EASIER . . . FASTER . . . CHEAPER

Talk about sound, strong, machinable welds in cast iron. Here's a way to get 'em . . . *but fast* . . . every time. Use Ni-Rod* electrodes"

Ni-Rod's easy-to-control arc speeds up all kinds of cast-iron repair work. Cuts labor, time, and costs. Raises welders' success scores on tough jobs.

Ni-Rod gives you thorough fusion . . . close color match . . . smooth bead that sheds slag. Works on A. C. or D. C.

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*Reg. U. S. Pat. Off.

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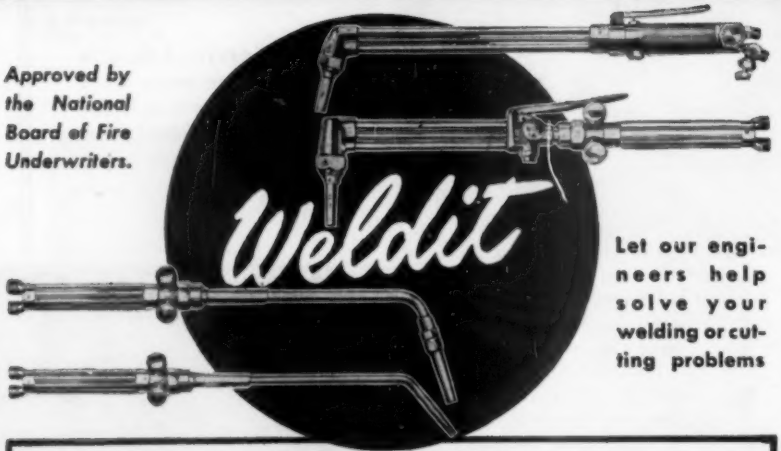

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All Weldits are built along rugged lines. They are strong, sturdy, and long lasting. . . . Perfection in balance has been given special attention. . . . All parts subject to wear are easy to get at for replacement purposes. The result of 29 years of experience is built into every Weldit torch. . . . Thousands are in daily use in America's largest industrial plants—*They Must Be Good.*

Weldit INC. SINCE 1918

Some distributor territory still available.

994 OAKMAN BLVD. DETROIT 6, MICH.

Metallizing Men to Meet in Tulsa, Dec. 2-4

SEMI-ANNUAL meeting of the American Metallizing Contractors Association will be held at the Mayo Hotel in Tulsa, Okla., on Dec. 2, 3 and 4. Members are expected to attend from both coasts, the midwest and the south.

The AMCA was formed in December 1947, in St. Louis through the joint efforts of William H. Fatka, Metallizing Inc., Chicago, and Walter B. Meyer, John Nooter Boiler Works Co., St. Louis. William C. Reid, formerly vice-president of Metallizing Engineering Co., Inc., Long Island City, N. Y., and now retired, has been elected into honorary membership and serves as consultant to the association. On Sept. 24, Mr. Reid left for England as association representative to get first-hand information on the extensive metallizing activities there.

Persons, firms or corporations engaged in metallizing contracting whose operations and practices comply with membership requirements are eligible for membership. Policy has been to exclude those metallizing contracting shops also serving as distributors for metallizing equipment. Manufacturers of such equipment are also ineligible.

Initiation fees are set at $100 with dues of $25 per quarter. Mr. Meyer is secretary-treasurer of the association, which has an office at 773 Brownell Ave., St. Louis 22.

* * *

Fenn College Constructs All-Welded Engineering Building

SPEEDY, silent construction of a new mechanical engineering building at Fenn College, Cleveland, is due to welded design. The building was completely erected and readied for welding in five days, and arc welded in another ten days by two weldors without any disturbance to nearby classrooms.

Shop fabrication was used wherever possible. The structure was first erected with the members bolted, and was then plumbed and guyed to ready it for welding. Building is 100 ft wide by 99 ft deep, three stories high with a total steel tonnage of 130 tons. It will house eight classrooms, two drafting rooms, mechanical shops, two offices, tool room and locker room.

* * *

Directory of Safety Films Available at Low Cost

COMPREHENSIVE listing of 403 motion pictures and slide films for safety education has been issued by the National Safety Council. Films are classified and indexed with film synopsis, type, source and availability for purchase, rental or loan. A copy of the listing may be obtained at twenty-five cents from National Safety Council, 20 North Wacker Drive, Chicago 6.

Witt Gauge Purchased by James P. Marsh

WITT GAUGE DIVISION of National Pressure Cooker Co., Eau Claire, Wis., has been purchased by the James P. Marsh Corp., Skokie, Ill. Witt oxygen and acetylene gauges will in the future be produced in the Marsh plant by the Witt Gauge Division of James P. Marsh Corp.

Manufacturer of precision instruments since 1865, the Marsh organization has recently completed a new plant in the northwest Chicago suburb of Skokie.

* * *

South African Gas Plant Steps Up Production

MESSRS. Thermal Welding Products, Ltd., of Benoni, Union of South Africa, announces that it is producing oxygen and acetylene on a large scale. The company has a share capital of 500,000 pounds and buildings and equipment which cost about 250,000 pounds. The plant was built in the United States.

* * *

Welded Ammonia Piping Installed in Lockers

LOS ANGELES Cold Storage Co., Los Angeles, recently installed 5,400 ft of oxyacetylene-welded ammonia coils in seven frozen food storage rooms. Wrought-iron pipe of 1¼-in. diameter was used. Even on bends of 180 deg on 6-in. centers, no flattening of the pipe occurred.

* * *

New Off-the-Road Hauler Developed by LeTourneau

R. G. LETOURNEAU, INC., Longview, Tex., has introduced an all-welded trailer called the TH-4 "Tournahauler", capable of hauling heavy materials such as pipes, timber, steel members, etc., through mud, sand and gravel. In tests, 26,000-lb pipe loads were pulled through mud so thick that the rear wheel hubs were submerged.

"Could you take in this suit a little, Mac?"

10, 40 and 60 Cu. Ft.
ACETYLENE
CYLINDERS
NOW AVAILABLE
for Early Delivery

New Low Prices
Faster Pumping
Lighter Weights

These are plus features of the new C G Cylinders with the C G C improved porous monolithic filler. Completely tested and approved by the U. S. Bureau of Explosives . . . these new Acetylene Cylinders conform in every detail to ICC specification EIGHT!

All large sizes...100, 150, 250 and 300 minimum Cu. Ft. capacities ... are also available, and hold maximum gas capacities at normal pumping pressures.

New, EASIER TO GRIP OCTAGON CAP

The exclusive CGC Octagon Cap is now available for separate order. 50% thicker dome, 25% lighter weight, smooth finish and extra large shipping tag holes are popular features.

CGC

COMPRESSED GAS CYLINDERS, Inc.

P. O. Box 222, Vernon Branch • 2909 East 54th Street, Los Angeles 11

- Edges to be welded are brought into alignment.
- Parts are held securely.
- Both hands are freed for handling welding equipment.

"Saves us valuable time every day!" say welders by thousands. Simplifies and speeds work. Jaws built in U-shape for utmost visibility and working space. Jaws adjustable up to 1-5/8". Repays the low price in a short time.

Order from your jobber or direct from

PETERSEN MFG. CO.,
Dept. WE-11
Dewitt, Nebr.

LOCKS to the work

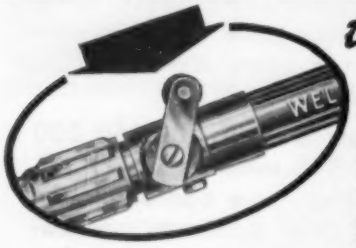
9 in.

$2.95

VISE-GRIP Welding Clamp

for Mass Production Welding

there's no torch like the

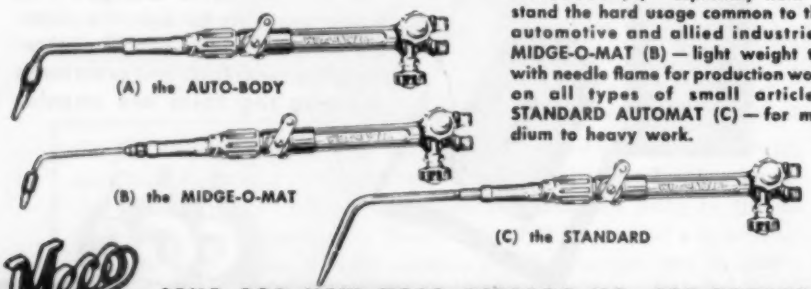


Meco AUTOMAT

The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.

AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.



(A) the AUTO-BODY

(B) the MIDGE-O-MAT

(C) the STANDARD

SEND FOR NEW MECO CATALOG NO. 130 TODAY!

Meco Modern Engineering CO., Inc.

3411 WEST PINE BLVD. ST. LOUIS 3, MO.

Adjustable Turbine Blades Repaired with Stainless Rods

REPAIR of turbine blades of adjustable turbines using stainless electrodes and precast stainless-clad blade inserts, was described in an excellent paper presented at the fall meeting of the American Society of Mechanical Engineers at Portland, Ore. Joel B. Justin, consulting engineer of Justin and Courtney, Philadelphia, and E. T. Davis, Indiana Michigan Electric Co., Mishawaka, Ind., were co-authors.

Repairs described were made at the Kanawha Valley Power Co. hydro-electric plants at London, Marmet, and Winfield, West Va. Work has been carried on during low-water periods over the four years since 1943, with one exception, and was recently completed.

The nine turbines at the three plants were installed from 1935 to 1937. They operate under heads of 24 to 26 ft and are rated at 6,600 to 9,200 hp. Blade units are 169 to 172 in. in diameter.

Cavitation occurred on the blades within the first year of operation. In 1937 one turbine at Marmet was repaired by covering a total of 52.6 sq ft of it with 752 lb of stainless and 400 pounds of mild-steel weld deposits and grinding to size. Though cavitation on all turbines continued, no repairs were instituted until 1943 because of war preparedness and wartime exigencies.

By this time, severe damage had been done and in several cases the periphery of the blades was entirely gone. Cast throat rings 1¼-in. thick were eroded to a depth of ¾ in. and in some areas were completely pierced.

When repair operations recommenced, columbium-stabilized 25-12 stainless electrode was used to keep carbon pick-up to a minimum.

A scaffold was constructed below the blades and an exhaust blower with ducts was used to get rid of the welding fumes and gases. A total of five tons of welding electrodes was consumed in the repair of some 646 sq ft of turbine blades.

Blade repairs also required the use of precast inserts to be welded to them. The throat ring was first machined by using the cutting tool as a boring mill and then welding preformed stainless clad plates to the throat ring to conform to the original contour. Shaft sleeves were metal sprayed and machined in place.

Heavy grinding tools were used to finish off the deposits. A "swing-arm" grinding tool was devised to make overhead grinding more safe and efficient.

* * *

All-Welded Tug Built For Use on Amazon River

A WELDED steel twin-Diesel tug has been built for use on the Amazon River by the Mill Basin Ship Repair Co., Inc., Brooklyn, N. Y.

Weight of the boat was kept to 30 tons so that it could be shipped to Belem, Brazil, on a freighter deck. Shell below the water line is 5/16-in. plate, and above the water line it is ¼-in. plate.

OTS Report Dicusses German Cutting Apparatus

LARGE shape-cutting machines and apparatus for flame-hardening were among war-time developments of the German oxy-fuel gas apparatus industry, according to a report prepared by Hans R. Pufahl, OTS investigator. The material quality of torches, accessories and machines had deteriorated markedly in comparison to products which were available before 1939, undoubtedly due to the necessity of having to use substitutes and eliminate finish and to reduce to a minimum the use of scarce materials which could not be replaced.

Regular German cutting torches, the report reveals, are practically all of the same general design. They do not have the capacity of American torches, and for this reason require very high oxygen pressures to cut heaviest sections. Another design difference is in the shape of the cutting tip, which is of the internal-external type utilizing a ring flame preheat in contrast to the multiple-orifice type commonly used in this country. This feature provides good uniformity of heat distribution, but, because of its lower flame velocity, it undoubtedly has less flashback resistance.

Regulators controlling gases at high pressures are constructed so as to have the pressure-adjusting screw point downwards and gauges upwards when the regulator is properly applied to the cylinder valve. This construction and design is believed to afford a measure of protection to the work and others in the vicinity if, due to neglect to release the pressure adjusting screw, the regulator cap should blow off at the cylinder valve opening on account of sudden pressure. A special regulating system was developed for the equal balancing of pressure: the oxygen delivery pressure just balances the acetylene delivery pressure.

Deseaming, gouging, flame-hardening and underwater cutting torches using benzine are described and illustrated in the 80-page report, Equipment for Use with Oxygen and Fuel Gases for Welding and Cutting.

Part III of the report contains information on portable cutting machines, large stationary shape-cutting machines, flame-hardening machines and a welding machine for sheet metal. One of the portable cutting machines has a small air or gas motor of special design which uses the cutting oxygen pressure as driving power. Copies of the report (PB-40315) may be had at $2.25 each from the Office of Technical Services, Department of Commerce, Washington 25, D. C.

* * *

All-State Announces New Distributors

ALL-STATE WELDING ALLOYS CO., INC., White Plains, N. Y., has appointed H. M. Parker & Son, Glendale, Calif.; Herrick Co., Boston, Mass.; L. W. Jaeger Ignition Co., Springfield, Mass.; Welding Supply Co., East Paterson, N. J.; and Littell Parts, Medford, Ore. as distributors of its low-temperature welding and brazing alloys and fluxes.

True Portability

For years, WELDERZ FREND GENERATORS have been accepted as the "standard" generator for Oil Field work. In all the major oil fields WELDERZ FREND outnumbers other generators by a wide margin. There's a reason for this widespread acceptance. That reason is its portability. The WELDERZ FREND is the ONLY truly portable generator. By portable, we do not mean a generator which can be placed on a cart and hauled about the shop ALONE, but one which can be placed on a truck and hauled over the roughest of terrain (without removing the hopper or draining the generator) in absolute safety. When you arrive at your job, turn the Splash Shield Lever to "Open" position and you are ready to go to work. When you are ready to move to another job, simply return the Splash Shield Lever to "Closed" position and you are ready to go again.

WELDERZ FREND GENERATOR CO.,
LUBBOCK, TEXAS

WELDERZ FREND

THE DECEMBER ISSUE OF THE WELDING ENGINEER WILL CARRY A COMPLETE REPORT ON THE ANNUAL METAL SHOW AND THE ANNUAL MEETING OF THE A. W. S.

Sugar Equipment Welded in Australian Mills

ARC-WELDED construction of sugar mill equipment is helping to bring down costs in Australian sugar mills. Both vacuum pans and Effet vessels are now welded rather than cast. The vessels range in size from 7 to 14 ft in diameter and 8 to 16 ft high. Previously, the diameters were obtained by casting vertical flanged sections, machining the joints and then drilling and bolting them together. New procedure is to roll mild-steel plates to shape and assemble them by welding the joints.

A vacuum pan under construction in the Brisbane workshops of A. Seargeant Pty., Ltd., weighs only 24 tons as compared with 32 tons for a cast vessel of comparable capacity.

—*McGraw-Hill World News*

* * *

Western Firm Sold to U. S. Steel Subsidiary

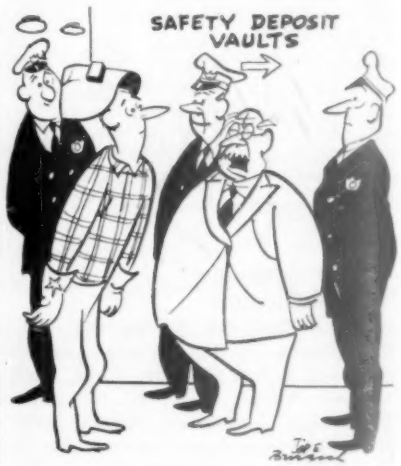
CONSOLIDATED WESTERN STEEL CORP. of Los Angeles, including the plants formerly operated by Western Pipe & Steel Co. of California and the Steel Tank & Pipe Co. of California were sold recently to a U. S. Steel subsidiary which is also called Consolidated Western Steel Corp. Mailing and delivery addresses of the offices and plants involved will remain unchanged.

* * *

New Research Laboratory Studies Aluminum Problems

TRENTWOOD aluminum research laboratory of the Permanente Metals Corp., goes into full operation this fall near Spokane, Wash. Dr. Paul Ziegler heads the staff.

Nine separate laboratories will handle various phases of the program for aluminum research. These will cover problems of aluminum production, both in reduction and fabrication; development of alloys; aluminum welding and soldering techniques; effects of all kinds of atmospheric conditions; metal finishing.



"We have a little job for you—but don't get any ideas!"

About People

DR. LEWIS WARRINGTON CHUBB, director emeritus of the Westinghouse Research Laboratories has retired after 43 years of research with Westinghouse. Dr. Chubb served as director of the laboratories from 1930 until assuming his honorary emeritus post last March. He holds more than 150 patents on inventions in radio, electronics, jet propulsion, electrical equipment, radar, etc. and is the inventor of electro-percussive welding, a resistance-welding process. Last year he was awarded the John Fritz Medal.

* * *

O. R. SCHROEDER is vice-president of development and engineering of the Weldaloy Products Co., Detroit. He was formerly director of metallurgical research for the Great Lakes Steel Corp. and has worked under DR. W. F. HESS of Rensselaer Polytechnic in the development of resistance-welding processes for various steels.

* * *

RAY R. WEST has been named sales manager of Minneapolis-Honeywell Regulator Co. products for industrial applications.

* * *

L. D. RICHARDSON has been appointed to the board of regional sales supervisors of Eutectic Welding Alloys Corp., New York City, and will have charge of the south central area of the country. WILLIAM R. BAJARI, and G. LUKE MIZELL have been appointed to similar posts for the company and will be in charge of the western region and the middle and south Atlantic regions, respectively.

* * *

A. R. KELSO has been appointed executive vice president of The Federal Machine and Welder Co., Warren, O. He will have administrative charge of all divisions including Warco Press, Federal Welder and Warren Stamping Divisions. W. F. LONGFIELD is sales manager of the Warco Press Division.

* * *

WALTER E. MCARTHUR is eastern regional manager for the Nelson Stud Welding Division of Morton-Gregory Corp., at Lorain, O. GENE P. HOPKINS has been appointed general works manager of the division.

* * *

M. T. VICTOR, formerly sales and field engineer for Keystone Carbon Co., has been elected president of the newly formed International Powder Metallurgy Co. of Ridgway, Pa. Vice-president in charge of production is G. J. HOEHN and secretary-treasurer is E. C. BERGER.

S-T-R-E-T-C-H THE LIFE OF YOUR EQUIPMENT with...

MANGANAL

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11% to 13½% Manganese-Nickel Steel

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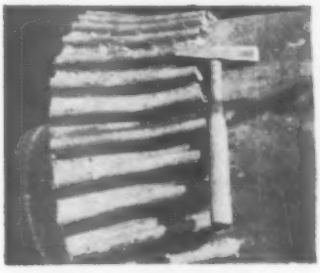

Sold in square, round, flat and special shapes. Can be cut to length required. Manganal costs less in the long run because it work-hardens under impact and abrasion, therefore lasts longer. Gets your equipment back on the job faster by eliminating the building up of weld material.

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"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

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No. 4 FLUXINE, in powder form, for welding cast iron with bronze rods.

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No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

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No. 43 FLUXINE . . . non-glaring . . . used when low-melting silver solders are specified. No injurious fumes. Goes further than most fluxes.

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Standard 3 speed counter shaft type Strand machines also available for portable rotary power at constant speeds for grinding, buffing, drilling, wire brushing and rotary filing, in all types and models from ⅛ to 3 H.P.—for every specific requirement. Send for Catalog No. 30.

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Welding & Cutting
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60 E. 42nd St., New York 17, N. Y.

S. C. LAWSON, assistant general sales manager of Ampco Metal, Inc., Milwaukee, has been appointed general sales manager, succeeding R. J. THOMPSON who will be located in California as engineering and sales director for the company's west coast activities.

* * *

GEORGE F. MUELLER was elected assistant secretary of Fansteel Metallurgical Corp., North Chicago, Ill., at a recent directors' meeting.

* * *

DR. PHILIP J. WILSON, JR., has left Mellon Institute to join the Research and Development Division of Carnegie-Illinois Steel Corp., Pittsburgh, as a research associate.

* * *

EDWARD C. FALES, executive vice-president of the American Welding and Manufacturing Co., Cleveland, has been elected a director of the company.

* * *

JOHN W. COLGAN, sales manager of Handy & Harman, New York City, was elected a director of the company at a recent meeting of the board of directors.

* * *

VICTOR L. PERSBACKER was appointed auditor of the American Brake Shoe Co., New York City, recently. He will also continue to serve as assistant comptroller. WILLIAM H. STARBUCK is assistant general sales manager of the company's Kellogg Division.

* * *

Recent personnel changes in the General Electric organization include FRANK E. GOLLIHER as production supervisor of the plastics division; CHARLES W. BENTLEY as assistant manager of the company's new Decatur, Ill., plastics molding plant and DAVID B. FOLKERTH as chemical department district representative in Pittsburgh.

* * *

New manager of Carnegie-Illinois Steel Corporation's Detroit district sales office is WILLIAM S. SAYLOR.

* * *

F. L. SARGEANT is manager of the New York sales division of Reynold Metals Co., Louisville, Ky. WILFRED P. LAWLESS is manager of the Nashville, Tenn., sales district for the company.

* * *

WILLIAM C. REID, consultant to the American Metallizing Contractors Association, left for England on Sept. 30 to inspect metallizing operations there. Mr. Reid will report on that country's large scale applications of zinc to structural members to the AMCA meeting at Tulsa in December. While in England he will visit several of the world's largest metal spray shops.

DR. DONALD HAMILTON MCLAUGHLIN has been elected a director of the International Nickel Co., Inc., New York City. He is president of Homestake Mining Co. F. E. ALLEN, formerly with the mechanical engineering department at Iowa State College, Ames, Ia., has joined the company's research and development division.

* * *

W. W. SIEG, executive vice-president of Titan Metal Mfg. Co., Bellefonte, Pa., has been elected president of the company.

* * *

W. F. DETWILER, chairman of the Board of Directors of Allegheny Ludlum Steel Corp. for the past ten years, has been named honorary Chairman. At the same time LESTER H. BITTNER was named to the newly created position of vice-president in charge of purchases.

* * *

ROBERT M. VILSACK has joined the sales department of Taylor Forge & Pipe Works at Chicago.

* * *

PAUL V. ROTH and FELIX WUNSCH, have retired from Leeds & Northrup Co. after 46 and 43 years service, respectively. Mr. Roth was shop engineer since 1919, while Mr. Wunsch was a member of the engineering staff and inventor of numerous circuits widely used in electrical measuring instruments today.

* * *

ROBERT J. POWELL is a refractory sales engineer for The Babcock & Wilcox Co., for Alabama, Tennessee and western Georgia and Florida.

* * *

DR. HAROLD VAGTBORG, president and director of Midwest Research Institute at Kansas City, Mo., has resigned to become president and director of Southwest Research Institute based in Houston, Tex.; director of the Institute of Inventive Research; and director of the Foundation of Applied Research; also as Technical Director of the 3,500-acre Essar Ranch, all located just outside the city limits of San Antonio, Tex.

* * *

M. B. GARBER, assistant sales manager and export manager of The Thew Shovel Co., Lorain, O., has been appointed general sales manager. He succeeds the late DON G. SAVAGE, who died on July 25.

* * *

MARVIN LEEPER has been appointed plant engineer at the Gary, Ind., plant of American Bridge Co., U. S. Steel subsidiary.

* * *

DR. WILLIAM MARSH BALDWIN, JR. an associate of Chase Brass & Copper Co., Cleveland, has been made Research Professor of Metallurgy at Case Institute of Technology, Cleveland.

Fuse-Well Cast Welding Rods

THE STANDARD OF QUALITY THROUGHOUT THE WORLD

CAST ALUMINUM
WELDING RODS
OF STANDARD ANALYSIS
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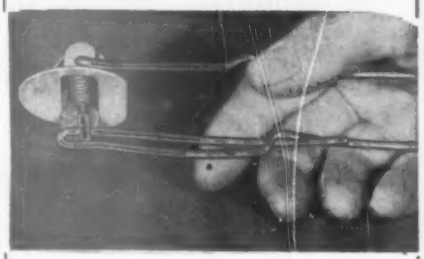

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Editor, *THE WELDING ENGINEER*

500 QUESTIONS—each answered clearly and understandably in this informative book. Answers the most important everyday questions of every man interested in welding.

Questions were carefully selected and screened from the most frequently asked by weldors about welding, cutting, materials, flame treating, inspecting, etc. Novice and expert alike can get a lot out of this book. It's easy to read, yet contains a fund of information. By using the handy index you can make this book very useful for quick answers to the questions that come up in your daily work.

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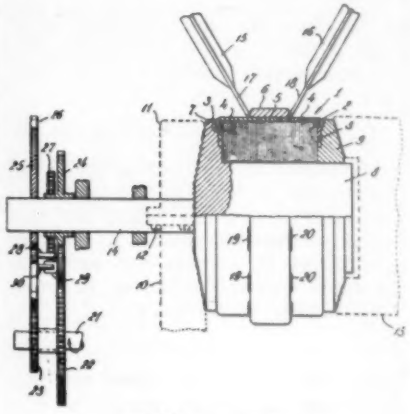

Arc Welding Apparatus

2,448,694. Joseph M. Tyrner, New York City, assigned to Air Reduction Co., Inc., New York City. Filed April 13, 1946. Issued Sept. 7, 1948.

Welding apparatus comprises means for holding a welding electrode in juxtaposition to the work, and means for producing relative motion between the work and the electrode. Variable speed drive for producing the relative motion comprises a constant speed drive shaft, a countershaft connected to the work, a pair of gears fixed to the drive shaft and a second pair of gears carried by the countershaft. One of the second pair of gears is fixed to the countershaft and the other is loosely mounted on it and a spring interconnects the gears on the countershaft. The gear fixed to the countershaft has blank spaces at intervals around the periphery whereby the gear is alternately driven by a gear on the drive shaft at a speed corresponding with normal welding speed, and then at a higher speed by the action of the other gear on the countershaft and the spring.

* * *

Flash Welder Control

2,443,965. Melvin M. Seeloff, Warren, O., assigned to The Taylor-Winfield Corp., Warren, O. Filed Feb. 3, 1945. Issued June 22, 1948. Flash-welding apparatus having fixed and movable platens for holding workpiece. A secondary of a welding transformer is connected to the workpieces held in the platens. A double acting cylinder has a piston connected to the movable platen for moving it. Conduits having adjacent inlet ports conduct fluid under pressure into opposite ends of the cylinder. A movable jet-tube having its discharge end positioned opposite the inlet ports supplies fluid under pressure to the inlet ports in proportions determined by the position of the jet-tube. Direction and speed of platen are thus controlled.

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YOU'LL find shear tests better, rejects fewer when you build your pre-spotwelding cleaning procedures around Oakite Compound No. 34. Solutions of this acidic detergent rinse freely, leave aluminum parts with fine, uniformly etched surfaces. You get more welds before cleaning tips. Write NOW for full, free details! No obligation.

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OAKITE

Specialized Industrial Cleaning
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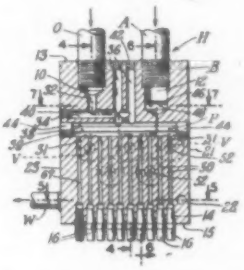
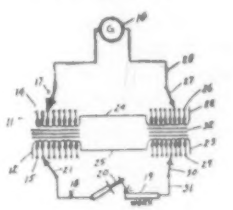
Multi-flame Torch Head

2,442,437. JAMES C. ROBBINS, ELIZABETH and THOMAS McELRATH, JR., Summit, N. J., assigned to UNION CARBIDE & CARBON CORP., New York City. Filed Aug. 19, 1944. Issued June 1, 1948.



A multi-flame torch head said to be free of undesirable popping in use is a body composed of a block of solid metal having a row of closely spaced gas-mixing passages and lateral recesses in spaced relation to the opposite sides of the passages. Cover plates enclose the recesses to provide lateral fuel-gas chambers. The block also has fuel-gas passages extending from the chambers to the opposite sides of each gas-mixing passage. The length of each gas-mixing passage is relatively great and its cross-sectional area minute whereby complete gas mixing is accomplished with as small a mixed-gas capacity as possible. Popping is of a minor nature, being restricted to each mixed-gas passage.

* * *



Arc Welding System

2,447,955. RAYMOND A. MILLHOLLAND and WILBUR F. SULLY, Indianapolis, Ind. Filed Sept. 20, 1944. Issued Aug. 24, 1948.

Patent has been granted for a three-way arc welder developed by W. F. Sully and Raymond A. Millholland of 5157 Winthrop Ave., Indianapolis, Ind. This is a modified transformer-type welder which can be used either for conventional arc welding or as the source of power for twin refractory electrodes when filler wire is fed automatically.

Feature of the patent is the three-way arc generated alternately between the twin electrodes and interconnecting with the work, which forms the third current path. Approximately one-third of the total current passes through the work. This has a preheating function for welding high heat-conducting metals. Power factor, at rated load, of .88 can be obtained without capacitors, either for single or multiple arc operation.

The inventors plan to license the manufacture of their welder to some established manufacturer.

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Santa Rosa, Calif.
Oklahoma Oxygen Co.
Tulsa, Okla.
Pacific Welding Supply
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H. M. Parker & Son
Glendale, Calif.
A. G. Pond Co.
San Jose, Calif.
Porter Welding Co.
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Saginaw Welding Supply Co.
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San Diego Welders Supply Co.
San Diego, Calif.
More will be listed in ads to follow.

ALL-STATE WELDING ALLOYS CO., Inc.
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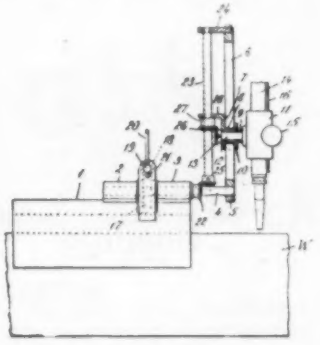
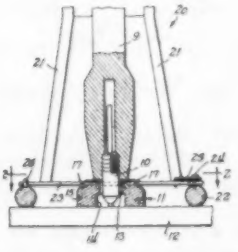
Flame Cutting Machine

2,448,089. SAMUEL DUVALL, Highland Park, Mich., assigned to AIR REDUCTION CO., INC., New York City. Filed Dec. 27, 1943. Issued Aug. 31, 1948.



A torch cutting machine for cutting round metal stock such as billets, bars and the like, comprises a base and a torch-supporting arm mounted on it for pivotal angular movement about an axis extending lengthwise of the work-piece. Means are provided for moving the arm angularly about the axis. A torch holder is pivotally connected to the arm so that it can swivel with respect to the arm about an axis parallel to the first-mentioned axis. A torch is mounted in the torch holder, and actuated by pivotal angular movement of the arm about the first-mentioned axis to positively turn the torch holder relative to the arm. The arm moves at such a rate and in such direction as to maintain the torch in a perpendicular direction during the angular movement.

* * *



Ferrule Holder for Welding Studs

2,447,113. ALBERT M. CANDY, La Grange, Ill., assigned to NATIONAL CYLINDER GAS Co., Chicago. Filed May 5, 1947. Issued Aug. 17, 1948.

A frame for use with a stud-welding gun, having a chuck for holding a stud within a welding stud ferrule. The chuck is movable for supporting the gun and engaging the work surface. An arm is rockably mounted at one end on one side of the frame and extends the longitudinal axis of the stud for engagement with the ferrule. Other end of the arm extends to the other side of the frame. A stop on the frame cooperates with the other end of the arm to limit its movement. A spring holds the ferrule in operative position with respect to the stud.

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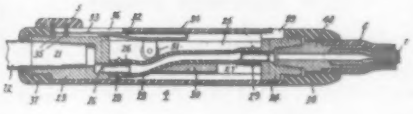
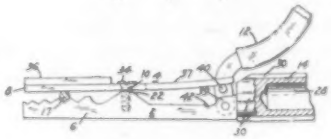


Gas-Arc Welding Apparatus

2,444,767. Richard W. Cobean, Schenectady, N. Y., assigned to General Electric Co., Schenectady. Filed May 29, 1944. Issued July 6, 1948.

A handle supports and supplies gas and electric current to the electrode holding tip of a gas-arc torch. The handle comprises a frame having a gas passageway extending through its tip-supporting front end portion and a hand grip mounted on and enclosing the frame. Frame has a longitudinal slot in its front end portion. A resilient tube for carrying gas extends within and lengthwise of the hand grip. The front end of the tube is connected with the gas passageway in the frame. A slide having one side frictionally engaging the inside surface of the hand grip also has one end bent back upon itself along its other side to form a spring loop. An operating member mounted on the other end of the slide extends through the slot in the hand grip. A roller mounted on the spring loop of the slide moves with the slide along and against the resilient tube. A supporting surface within the hand grip extends lengthwise along the other side of the resilient tube and is inclined to the path of travel of the roller. The slide upon it is mounted so that movement of the slide and roller lengthwise of the handle will control the flattening of the resilient tube between the roller and the inclined surface.

* * *



Electrode Holder

2,448,994. Archie W. McClary, Oakland, Calif. Filed June 28, 1946. Issued Sept. 7, 1948.

An electrode holder comprising a working arm terminating at one end in an electrode-engageable jaw and a flexible resilient working arm disposed with one end facing the jaw and constituting an opposing jaw for the holder. The flexible resilient working arm is balanced at an intermediate point to the first working arm to permit rocking of the flexible working arm thereon. Means are provided for flexing the working arm against an electrode placed between the jaws. Flexing means includes a lever pivoted at a point spaced from the flexible resilient working arm and extending toward and beyond the same. Means on the lever between its pivot axis and the flexible working arm is adapted to engage the lever as it moves about its pivot axis. The resilient arm is sufficiently flexible to permit movement of the engaging means to a position beyond dead center.

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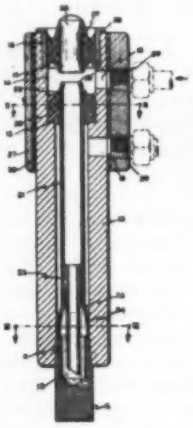
Air Filter Corporation
108-S North Water Street • Milwaukee 2, Wis.

R-W Electrode Holder

2,443,966. Melvin M. Seeloff, Warren, O., assigned to The Taylor Winfield Corp. Filed April 7, 1945. Issued June 22, 1948.



An electrode tip holder consists of a current-conductive tubular member having a socket at its lower end to frictionally retain a welding electrode tip. A tube is positioned in the member for abutting engagement with the inner end of the electrode tip. Upper end portion of the tube is supported by a means that also provides a fluid barrier in the space intermediate the tube and the inner side wall surface of the member. Ports are in the side wall of the member on opposite sides of the barrier. A rod is generally aligned with but normally axially spaced from the upper end of the tube. Fluid-proof mounting holds rod in the upper end portion of the member. Apertures are in the lower end portion of the side wall of the tube. An inner tube is held in the lower portion of the first tube at a point above the apertures but extending past them and outwardly of the lower end of the first tube. The outer wall of the inner tube is spaced inwardly of the side wall of the first tube in the vicinity of the apertures.

Induction Heater

2,439,517. Joel R. Johnson, Chicago, Ill., assigned to Western Electric Co., Inc., New York City. Filed Nov. 10, 1945. Issued April 13, 1948.

An electric induction heating apparatus for heating work pieces comprising a rotatable carrier for supporting and conveying a series of work pieces to be heated in succession along a predetermined path. A stationary cover is associated with the carrier and has a substantially closed channel for the passage of the work pieces. A stationary high frequency current heating loop is in one portion of the channel between spaced portions of which the work pieces travel. The hollow loop secured to the stationary cover has a cooling fluid circulated through it and arranged in and extending throughout the greater portion of the channel. A conduit is connected to the stationary cover and communicates with the channel for introducing a non-oxidizing atmosphere to prevent oxidation of the heated work pieces during cooling.

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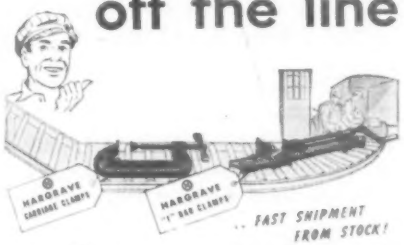

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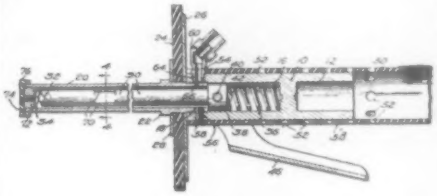
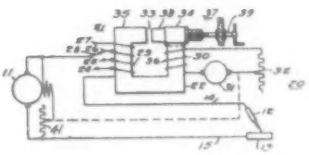
Heavy-Duty Electrode Holder

2,443,592. NORMAN A. BIRCH, Mahwah, N. J. Filed Aug. 18, 1945. Issued June 22, 1948.



An electrode holder with a tubular sleeve of low-resistance metal having holes near its outer end to receive an electrode transversely. A handle member of low-resistance metal is secured to the inner end of the sleeve with a good electrical connection. An insulating sheath surrounds the handle member. A shield extends radially from the sleeve at the forward end of the handle member. A plunger is slidable in the sleeve to press against an electrode extending through the holes. A spring is seated in the handle member and presses against the inner end of the plunger. To retract the plunger, a cam lever is pivotally secured to the plunger near the inner end. One end of the lever has a grip element extending adjacent to the handle member and is adapted to be pressed toward the handle to rock the lever on its pivot. The other end of the lever is a cam element movable against the shield by rocking the lever to force the pivot and plunger rearward.

* * *



A-C Welding System

2,443,671. ALFRED B. WHITE, Murrysville, Pa., assigned to WESTINGHOUSE ELECTRIC CORP., East Pittsburgh, Pa. Filed Dec. 3, 1942. Issued June 22, 1948.

An arc-welding system comprises a welding circuit including an electrode and work upon which welding is to be performed. It is connected to a source of direct current having an output control. Other elements are a saturable reactor having a magnetic core with an air gap and a winding connected in series with the welding circuit. The core is saturated when the welding current reaches a value which is less than the value of current for which the output control is adjusted. The saturation point of the core may be varied to effect saturation at different normal values of welding current. The means that varies the saturation point is operatively connected to the output control of the current source.

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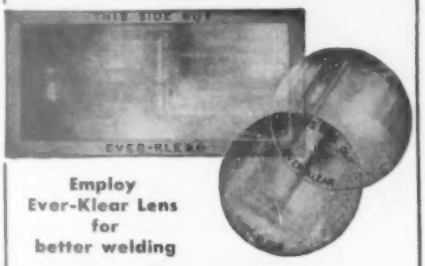

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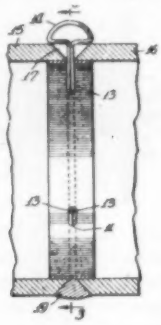
744 Broad St., Newark 2, N. J.

Method for Welding Pipe Joints

2,448,107. JOHN D. MATTIMORE and FRED C. SMITH, Louisville, Ky., assigned to TUBE TURNS, INC., Louisville. Filed Feb. 22, 1945. Issued Aug. 31, 1948.



This patent pertains to a method of butt welding the ends of tubular members with a welding ring therein. It consists in assembling the members in alignment, with the ends of the members telescoped over a welding ring provided with a plurality of separate spacers against which the ends of the tubular members abut. All of the spacers are frictionally retained in the rings and are completely removable intact for re-use. Tube ends are welded together by depositing weld metal in the space between the ends. Each spacer is removed prior to welding so that spacers are not melted or incorporated in the welded joint.

* * *

High-Speed Arc Welding

2,444,834. GEORGE G. LANDIS, South Euclid, and NORMAN J. HOENIE, Cleveland Heights, O., assigned to THE LINCOLN ELECTRIC CO., Cleveland. Filed June 2, 1944. Issued July 6, 1948.

A method of arc welding where an arc is established between a metal workpiece and the end of a metal electrode. Steps comprise striking an arc between the end of the electrode and workpiece and continuously feeding the electrode to the workpiece. Continuously imposed on the terminal portion of the electrode is an arc-welding current of sufficiently high density to produce more heat by the resistance heating of the terminal portion than is absorbed by the portion from the arc at the electrode end.

* * *

Electrode for Cast Iron

2,444,654. THEODORE EPHRAIM KIHLGREN, Scotch Plains, N. J. assigned to THE INTERNATIONAL NICKEL CO., INC., New York City. Filed Mar. 15, 1946. Issued July 6, 1948.

An arc-welding electrode for welding cast iron consisting of a core wire containing between 98.5% and 99.5% nickel and a flux coating enclosing the wire. The flux coating contains about 10 to 30 parts carbon, about 0.25 to 2.5 parts titanium alloy, iron powder ranging up to 30 parts, from 45 to 85 parts slag-forming materials and a binder.

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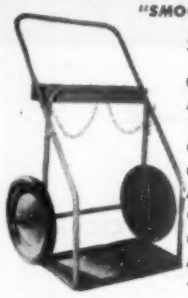

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